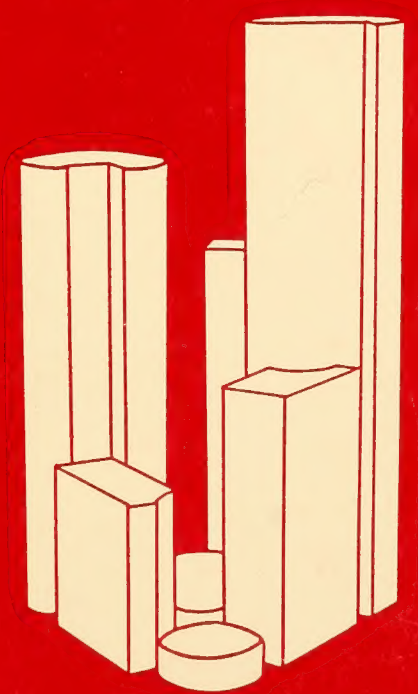
FINAL BOSTON REDEVELOPMENT AUTHORITY
ENVIRONMENTAL IMPACT REPORT

International Place at Fort Hill Square



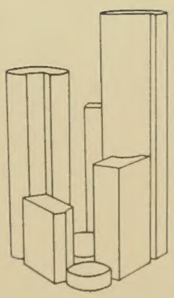
VOLUME II

Prepared for The Chiofaro Company

Prepared by HMM Associates, Vanasse/Hangen Associates, Colorado State University, Cosentini Associates and Haley & Aldrich, Inc.

Technical Appendix

Another version of This
is also on This number.



APPENDIX

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Transportation

TRAFFIC COUNT VOLUMES

TRANSPORTATION TECHNICAL APPENDIX

LIST OF CONTENTS

.FFIC MOVEMENT SUMMARY TABLE

.ON Congress Street & Franklin Street CITY OR TOWN Boston Proper

7/25/79 DAY OF WEEK Wed. WEATHER Fair RECORDER E.B.

TIME STARTS __ M	Congress St. Southbound			Franklin St. Westbound									TOTAL HALF HOURLY TALLY
	S		R	L		S							
00-7:30	182		27	26		13							248
30-8:00	214		33	22		26							295
00-8:30	233		43	30		52							358
30-9:00	222		60	44		73							399
00-9:30	199		37	36		71							343
30-10:00	194		62	37		38							331
00-10:30	189		48	35		48							320
30-11:00	228		52	41		51							372
00-11:30	244		61	42		43							390
30-12:00	231		45	47		55							378
00-12:30	245		56	48		44							393
30-1:00	253		62	46		46							407
00-1:30	194		54	37		41							326
30-2:00	201		55	34		39							329
00-2:30	195		51	35		45							326
30-3:00	220		42	32		48							342
00-3:30	223		46	41		51							361
30-4:00	234		54	47		56							391
00-4:30	241		61	57		63							416
30-5:00	247		69	59		67							442
00-5:30	253		73	43		71							440
30-6:00	224		69	40		72							405
00-6:30													
30-7:00													
00-7:30													
30-8:00													
00-8:30													
30-9:00													
00-9:30													
0-10:00													
00-10:30													
30-11:00													
OTAL	[illegible]		1160	873		1113							GRAND TOTAL
OTAL OF S.D.I.	6626			1986									[illegible]

INT. NO.

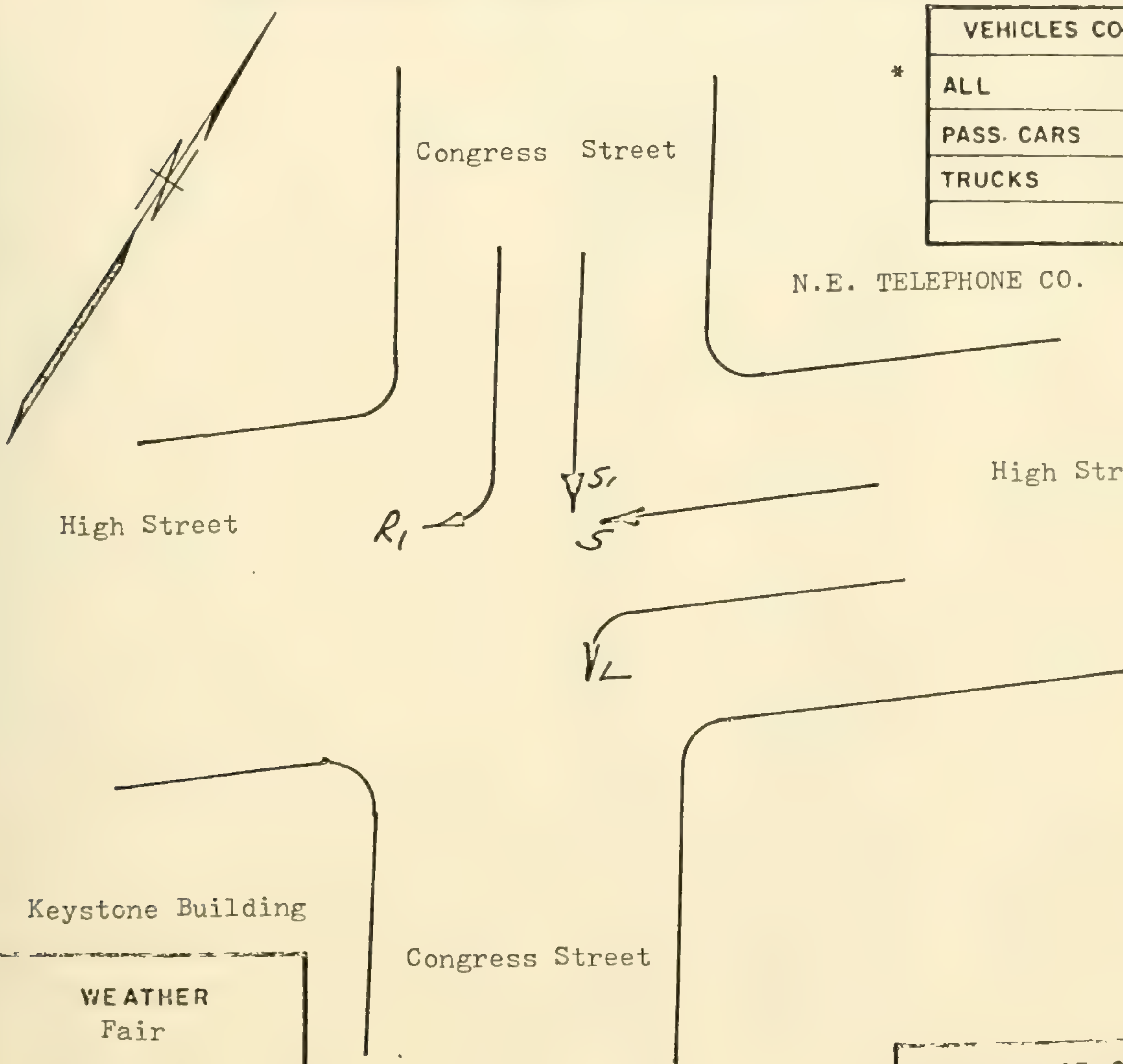
CITY ______ INTERSECTION Congress Street & High Street

DATE 8/1&2/79 DAY OF WEEK Wed-Thur

INTERSECTION TURNING MOVEMENT COUNT

#36 BRA 4

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER
Fair

COUNT TAKEN BY
W.C.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
7Am to 6pm	11

STREET		ENTERING VOLUME	FLOW PERCENT
High St.	SB	4620	38
Congress St.	EB	7675	62
[illegible]		12295	100

COMMENTS

.AFFIC MOVEMENT SUMMARY TABLE

ION Congress Street & High Street CITY OR TOWN Boston Proper

E 8/1&2/79 DAY OF WEEK Wed-Thur WEATHER Fair RECORDER W.C.

TIME STARTS __ M	High Street Southbound			Congress Street Eastbound									TOTAL HALF HOURLY TALLY
	L		S	S.		R.							
7:00-7:30	45		83	147		26							301
7:30-8:00	106		119	176		40							441
8:00-8:30	175		185	207		76							643
8:30-9:00	126		204	229		78							637
9:00-9:30	91		218	228		93							630
9:30-10:00	67		187	209		77							540
10:00-10:30	57		152	181		83							473
10:30-11:00	54		126	183		74							431
11:00-11:30	51		126	213		61							451
11:30-12:00	66		141	229		73							509
12:00-12:30	85		179	317		77							658
12:30-1:00	48		117	215		53							433
1:00-1:30	73		96	244		53							466
1:30-2:00	55		122	230		37							444
2:00-2:30	55		117	279		68							519
2:30-3:00	70		145	320		81							616
3:00-3:30	72		116	325		75							588
3:30-4:00	74		103	345		72							594
4:00-4:30	75		97	400		71							643
4:30-5:00	84		111	444		92							731
5:00-5:30	75		95	545		67							782
5:30-6:00	77		100	515		67							759
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	1581		2939	6181		1494							GRAND TOTAL
TOTAL OF L S R.	4520			7675									12,195

[illegible]

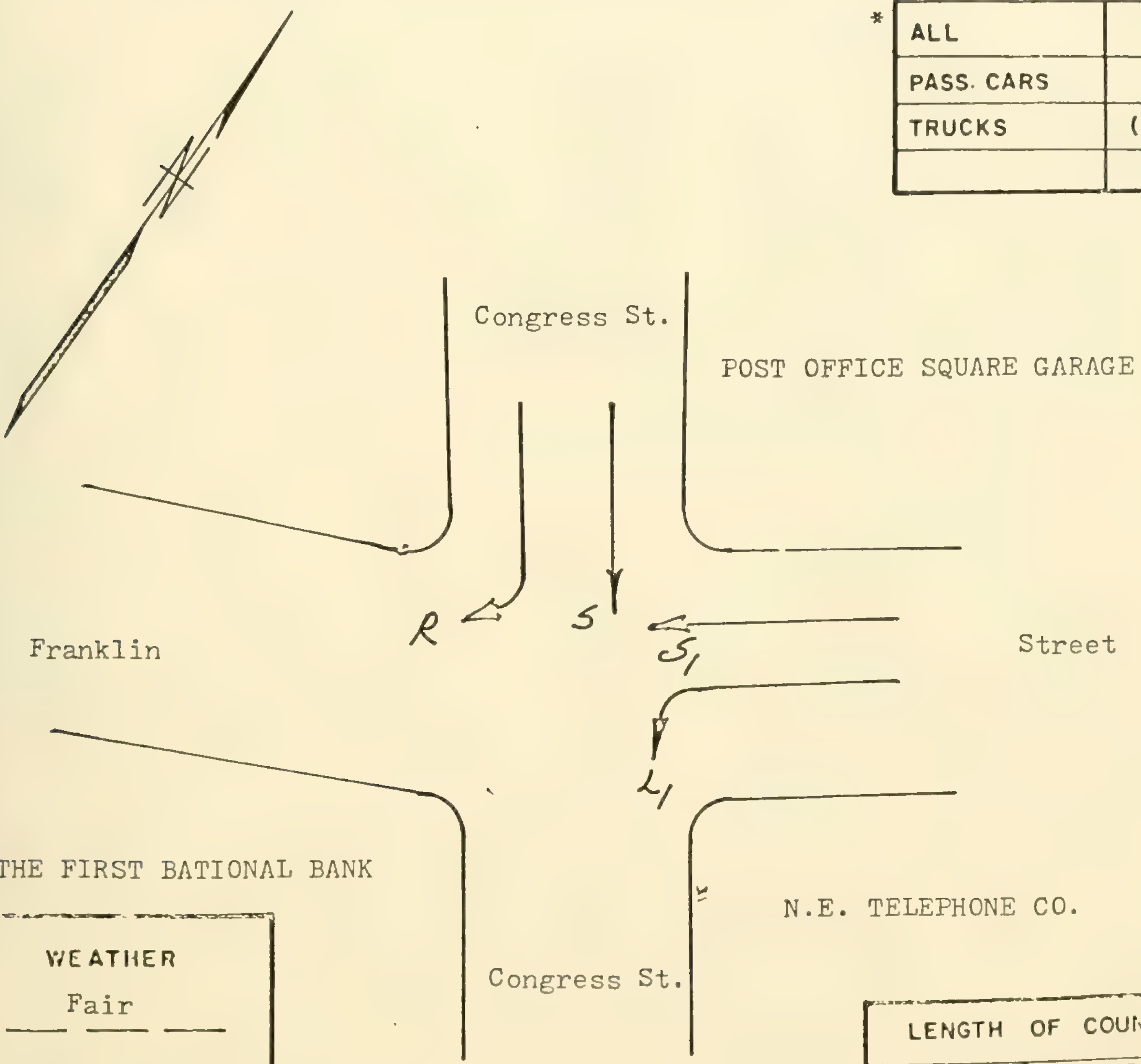
INT. NO.

INTERSECTION	Congress Street & Franklin Street
DATE 7/25/79	DAY OF WEEK Wed.

INTERSECTION TURNING MOVEMENT COUNT

#35 BRA 3-62

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER

Fair

COUNT TAKEN BY

E.B.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 hours

STREET		ENTERING VOLUME	FLOW PERCENT
Congress St.	SB	6026	75
Franklin St.	NB	1986	25
TOTAL		8012	100

COMMENTS

.AFFIC MOVEMENT SUMMARY TABLE

ION Congress Street & High Street CITY OR TOWN Boston Proper

E 8/1&2/79 DAY OF WEEK Wed-Thur WEATHER Fair RECORDER W.C.

TIME STARTS __ M	High Street Southbound			Congress Street Eastbound									TOTAL HALF HOURLY TALLY
	L		S	S.		R.							
7:00-7:30	45		83	147		26							301
7:30-8:00	106		119	176		40							441
8:00-8:30	175		185	207		76							643
8:30-9:00	126		204	229		78							637
9:00-9:30	91		218	228		93							630
9:30-10:00	67		187	209		77							540
10:00-10:30	57		152	181		83							473
10:30-11:00	54		126	183		74							437
11:00-11:30	51		126	213		61							451
11:30-12:00	66		141	229		73							509
12:00-12:30	85		179	317		77							658
12:30-1:00	48		117	215		53							433
1:00-1:30	73		96	244		53							466
1:30-2:00	55		122	230		37							444
2:00-2:30	55		117	279		68							519
2:30-3:00	70		145	320		81							616
3:00-3:30	72		116	325		75							588
3:30-4:00	74		103	345		72							594
4:00-4:30	75		97	400		71							643
4:30-5:00	84		111	444		92							731
5:00-5:30	75		95	545		67							782
5:30-6:00	77		100	515		67							759
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	1681		2939	6181		1494							GRAND TOTAL
TOTAL OF L S R.	4620			7675									12295

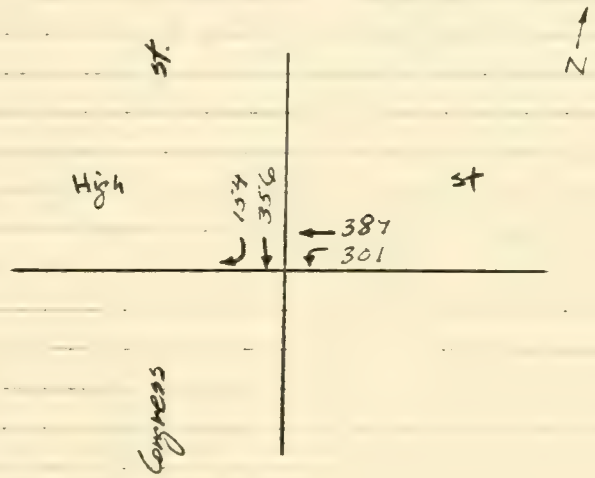
VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923
LOCATION: ______ SHEET ____ OF ____
CALCULATED BY: BG DATE ______
CHECKED BY: ______ DATE ______
TITLE: Turning Movement Counts

AM

Source: Dewey Sq TSM study (Traffic by S.G. Associates)



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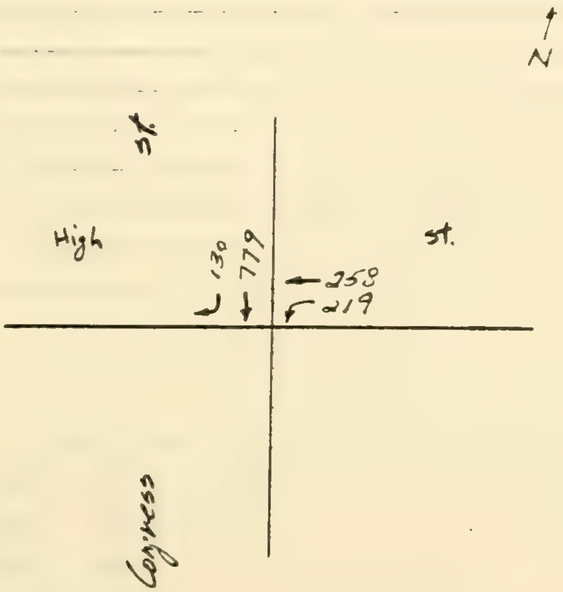


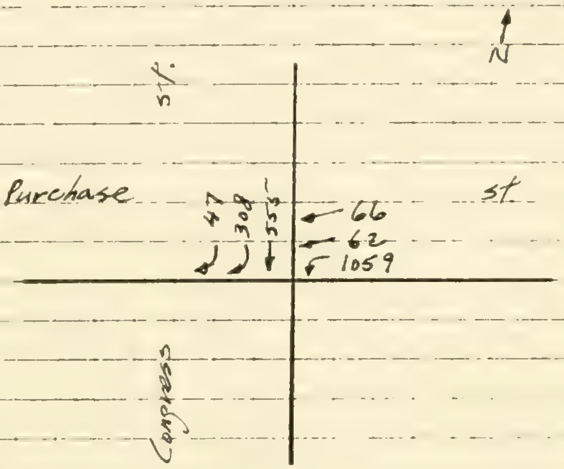
VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923
LOCATION: ______ SHEET ____ OF ____
CALCULATED BY: BG DATE ______
CHECKED BY: ______ DATE: ______
TITLE: Turning Movement Counts

AM

Source: Third Harbor EIR



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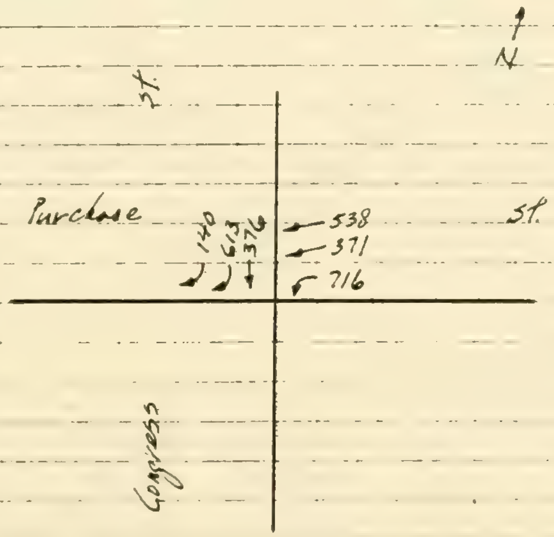


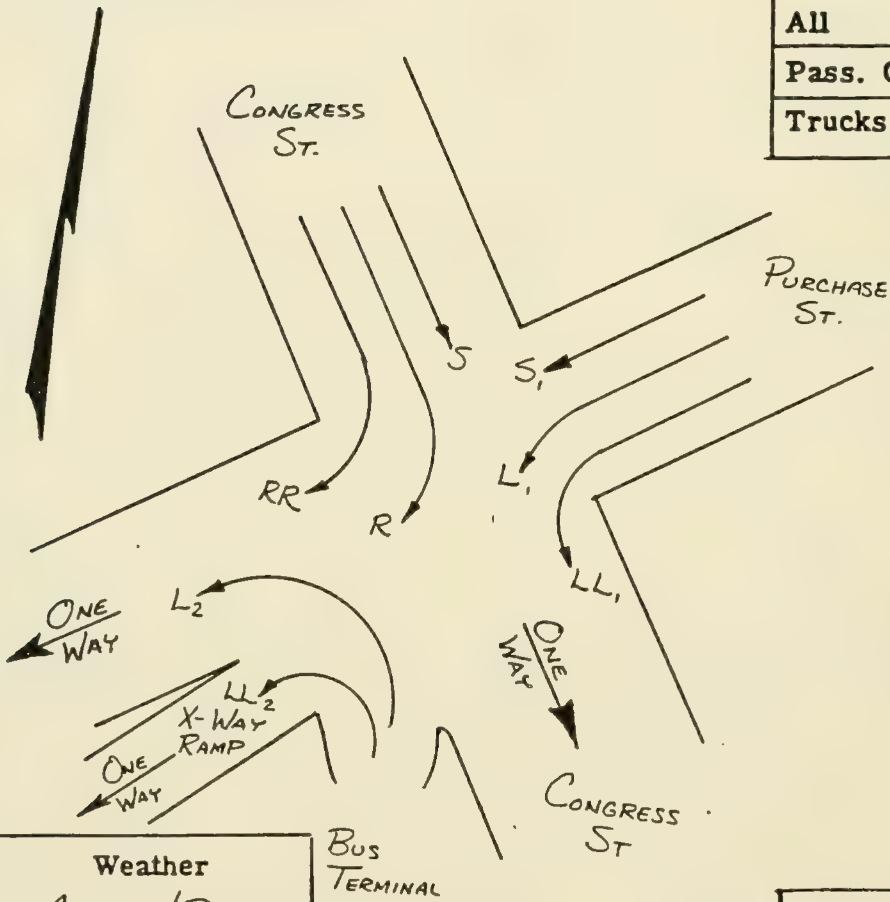
CONSULTING ENGINEERS, ARCHITECTS AND PLANNERS

City Boston-Proper
Intersection Congress St. & Purchase

INT. NO. 73 (BTPD# 3055) Date 6/10/83 Day of Week Friday

INTERSECTION TURNING MOVEMENT COUNT 3055

Vehicles Counted	
All	X
Pass. Cars	
Trucks	



Weather
Cloudy/Dry

Count Taken By
C.D. Schubert

Length of Count	
Time	Number of Hours
7AM-6PM	11 HRS

Street	Entering Volume	Flow Percent	Comments
Congress St. (SB)	9172	47%	
Purchase St. (WB)	10064	52%	
Bus Terminal	178	1%	
Total	19,414	100%	

PARK SQUARE ASSOCIATES, INC.

STA. NO. 73

3055

TRAFFIC MOVEMENT SUMMARY TABLE

Location Congress St & Purchase St. City or Town Boston-Proper

Date 6/10/83 Day of Week Friday Weather Cldy Recorder CDS

Time Starts 7:00AM	Congress St. (SB)			Purchase St. (WB)			Bus Term						Total Half Hour Tally
	S	R	RR	LL1	L1	S1	LL2	L2					
7:00-7:30	229	91	22	462	8	39	4	1					856
7:30-8:00	278	111	32	505	18	28	4	4					980
8:00-8:30	254	108	29	454	16	64	9	3					937
8:30-9:00	181	102	24	354	23	74	5	1					764
9:00-9:30	163	105	43	327	9	52	4	2					705
9:30-10:00	135	126	26	285	23	51	5	7					658
10:00-10:30	167	108	35	263	24	63	6	6					672
10:30-11:00	161	112	28	274	13	69	0	2					659
11:00-11:30	157	140	36	299	18	71	5	0					726
11:30-12:00	212	135	48	313	19	60	5	5					797
12:00-12:30	215	142	37	324	10	81	7	8					824
12:30-1:00	171	115	16	222	10	71	4	3					612
1:00-1:30	228	176	29	273	22	83	1	2					814
1:30-2:00	172	151	28	253	18	86	2	4					714
2:00-2:30	187	180	37	251	14	79	1	0					749
2:30-3:00	183	168	45	289	28	66	2	6					787
3:00-3:30	223	247	29	243	89	119	8	1					959
3:30-4:00	195	258	40	337	186	150	3	3					1172
4:00-4:30	282	301	41	324	166	145	3	8					1270
4:30-5:00	258	289	26	326	165	105	2	8					1179
5:00-5:30	313	322	36	338	237	122	6	9					1383
5:30-6:00	241	354	39	274	142	138	2	7					1197
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	4605	3841	726	6990	1258	1816	88	90					GRAND TOTAL
Total of L S & R	9172			10,064			178						19,414

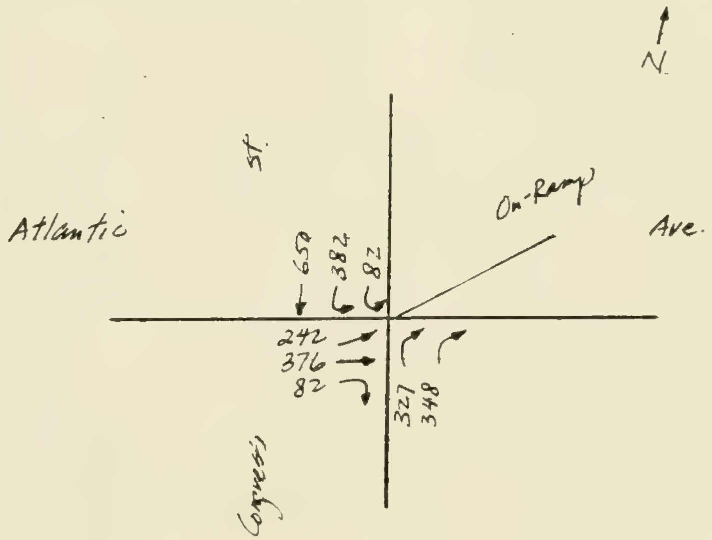
VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB International Place JOB No. 0923
LOCATION ________ SHEET ____ OF ____
CALCULATED BY BG DATE ________
CHECKED BY ________ DATE ________
TITLE Turning Movement Counts

AM

Source: Dewey Sq. TSM Study (Traffic by S.G. Associates)



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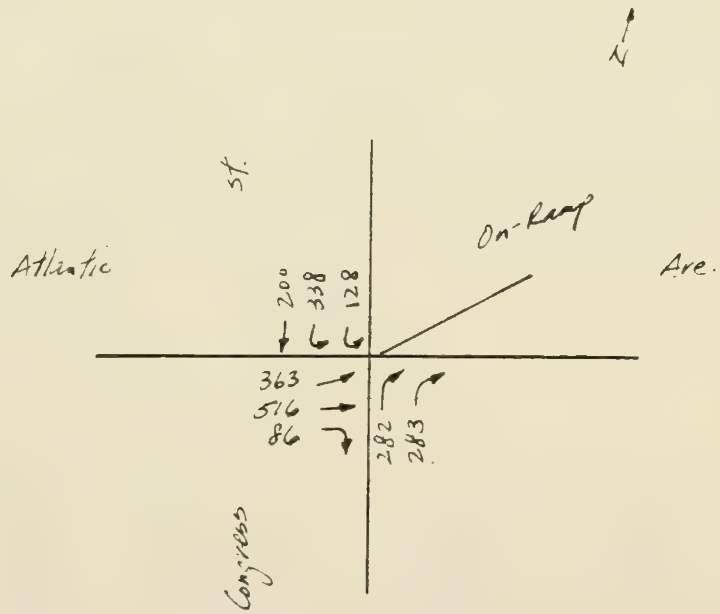
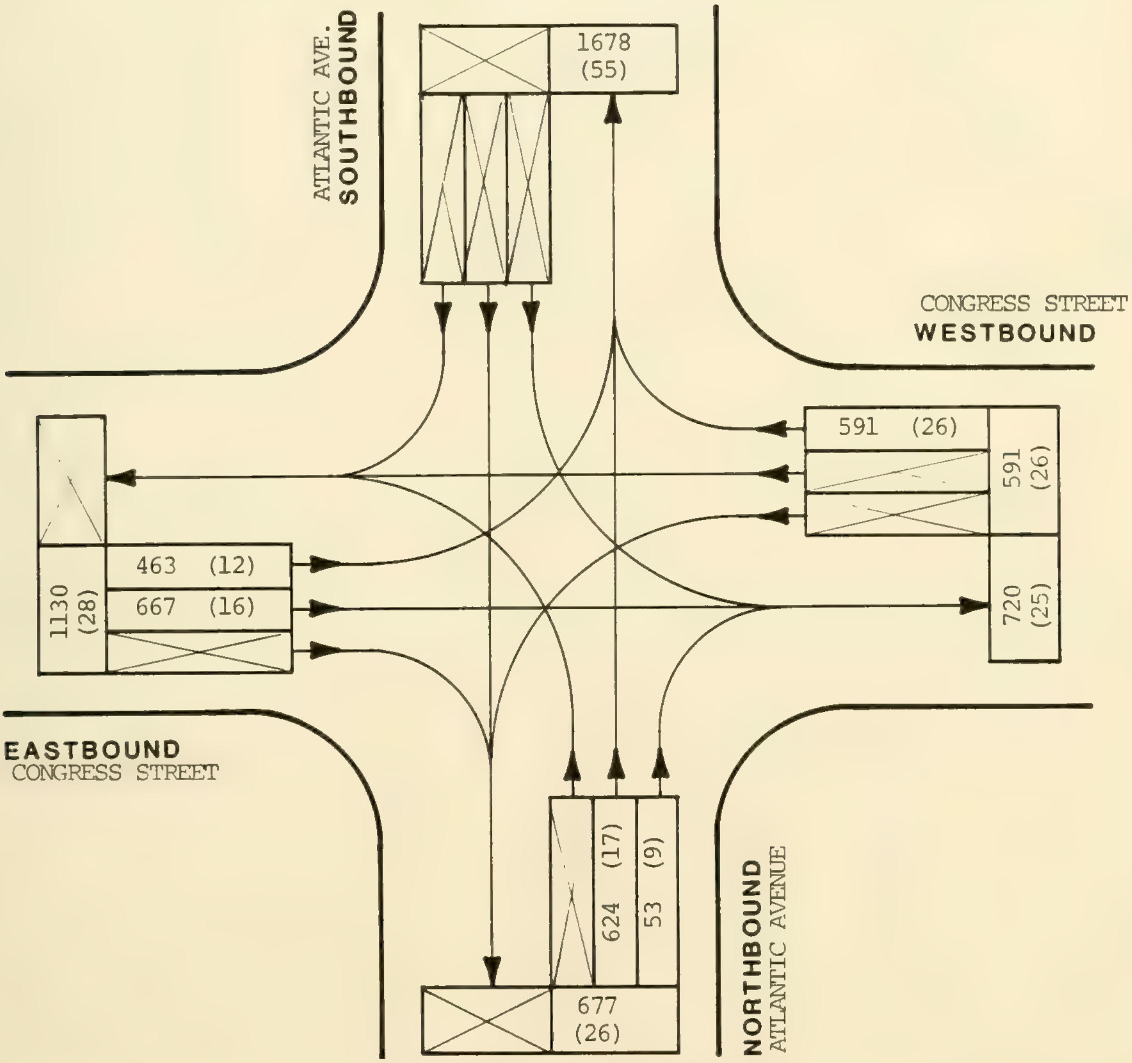


Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 11/17/81 DAY of WEEK Tuesday

INTERSECTION Atlantic Avenue @ Congress Street JOB No. 0121-10



STREET		ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
ATLANTIC AVENUE	N.B.	677 (26)	28%	4:30PM - 5:30PM
CONGRESS STREET	E.B.	1130 (28)	47%	
CONGRESS STREET	W.B.	591 (26)	25%	PM Peak Hour
				VEHICLES COUNTED
				ALL VEHICLES XXX
				TRUCKS (XX)
TOTAL		2398 (80)	100%	PERCENT TRUCKS 3.3 %

Traffic Control Systems
Planning, Engineering, Construction & Maintenance.
Brighton, Ma. Tel. (617) 782-9757

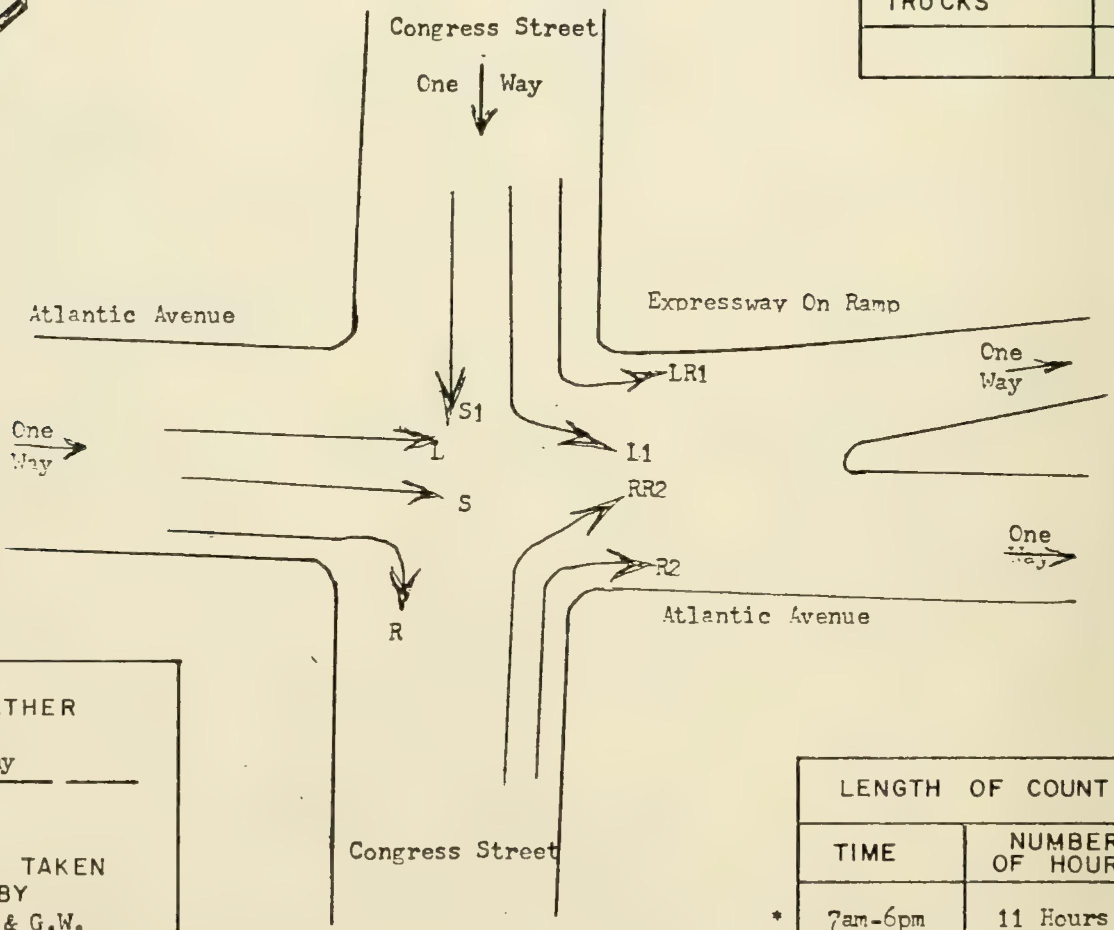
INT. NO. 415

CITY	Boston Proper
INTERSECTION	Atlantic Avenue & Congress Street
DATE 6/22/81	DAY OF WEEK Monday

INTERSECTION TURNING MOVEMENT COUNT

#305

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER

Rainy

COUNT TAKEN BY

J.T. & G.W.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 Hours

STREET		ENTERING VOLUME	FLOW PERCENT
Atlantic Avenue	NB	7911	30.6
Congress Street	EB	11834	45.8
Congress Street	WB	6099	23.6
TOTAL		25844	100%

COMMENTS

Planning, Engineering, Construction, & Maintenance
Brighton, Ma. Tel. (617) 782-9757

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION Atlantic Avenue & Congress Street CITY OR TOWN Boston Proper

DATE 6/22/81 DAY OF WEEK Monday WEATHER Rainy RECORDER J.T. & G

TIME STARTS __ M	Atlantic Avenue Northbound			Congress Street Eastbound			Congress Street Westbound							TOTAL HALF HOUR TOTAL
	L	S	R	LR1	L1	S1	RR2	R2						
7:00-7:30	143	149	30	29	212	406	215	165						134
7:30-8:00	129	168	51	39	236	459	159	145						138
8:00-8:30	135	157	49	37	234	450	165	151						137
8:30-9:00	120	240	38	59	212	309	162	197						133
9:00-9:30	124	184	28	46	201	290	150	171						119
9:30-10:00	115	165	40	57	152	246	118	100						99
10:00-10:30	126	159	27	50	146	239	106	95						94
10:30-11:00	106	171	43	55	136	233	104	87						93
11:00-11:30	132	184	40	58	130	260	138	136						1078
11:30-12:00	121	169	29	53	139	229	126	109						975
12:00-12:30	132	172	34	77	112	252	129	97						1003
12:30-1:00	127	177	39	78	120	237	132	121						1031
1:00-1:30	132	162	33	80	109	278	113	87						99
1:30-2:00	168	171	39	92	96	342	114	113						1135
2:00-2:30	142	149	26	75	89	336	167	145						1129
2:30-3:00	139	150	18	89	114	273	133	120						1036
3:00-3:30	124	201	33	79	93	286	144	101						1061
3:30-4:00	105	317	20	53	87	355	138	196						1271
4:00-4:30	71	353	18	49	109	445	91	228						1364
4:30-5:00	110	319	23	91	153	470	141	237						1544
5:00-5:30	73	311	22	79	138	475	124	225						1447
5:30-6:00	69	335	20	69	150	402	75	129						1249
6:00-6:30														
6:30-7:00														
7:00-7:30														
7:30-8:00														
8:00-8:30														
8:30-9:00														
9:00-9:30														
9:30-10:00														
10:00-10:30														
10:30-11:00														
TOTAL	2643	4568	700	1394	3168	7272	2944	3155						GRAND TOTAL
TOTAL OF LS & R	7911			11834			6099							25844

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: *International Place* JOB No. *0923*

LOCATION: ________ SHEET ____ OF ____

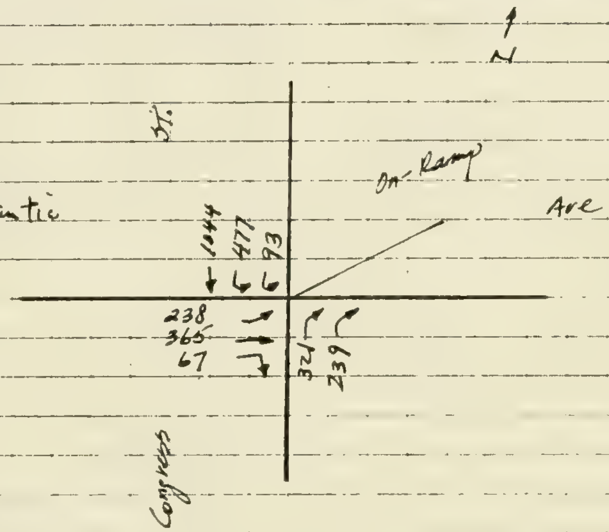
CALCULATED BY: *BG* DATE: ________

CHECKED BY: ________ DATE: ________

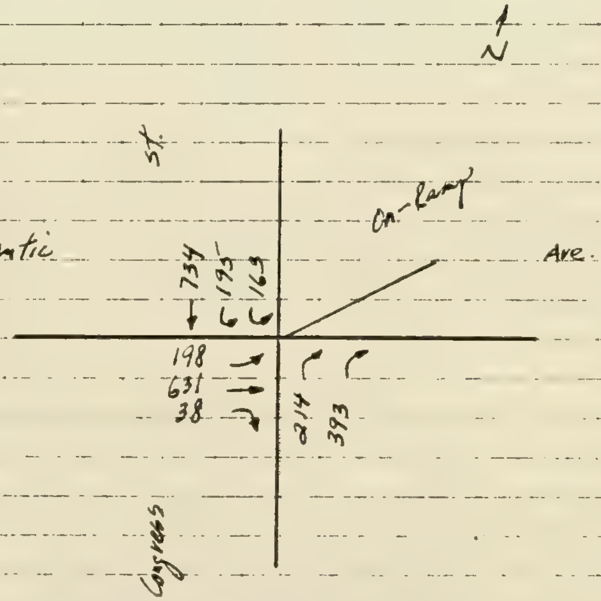
TITLE: *Turning Movement Counts*

AM

Source: Third Harbor EIR



PM



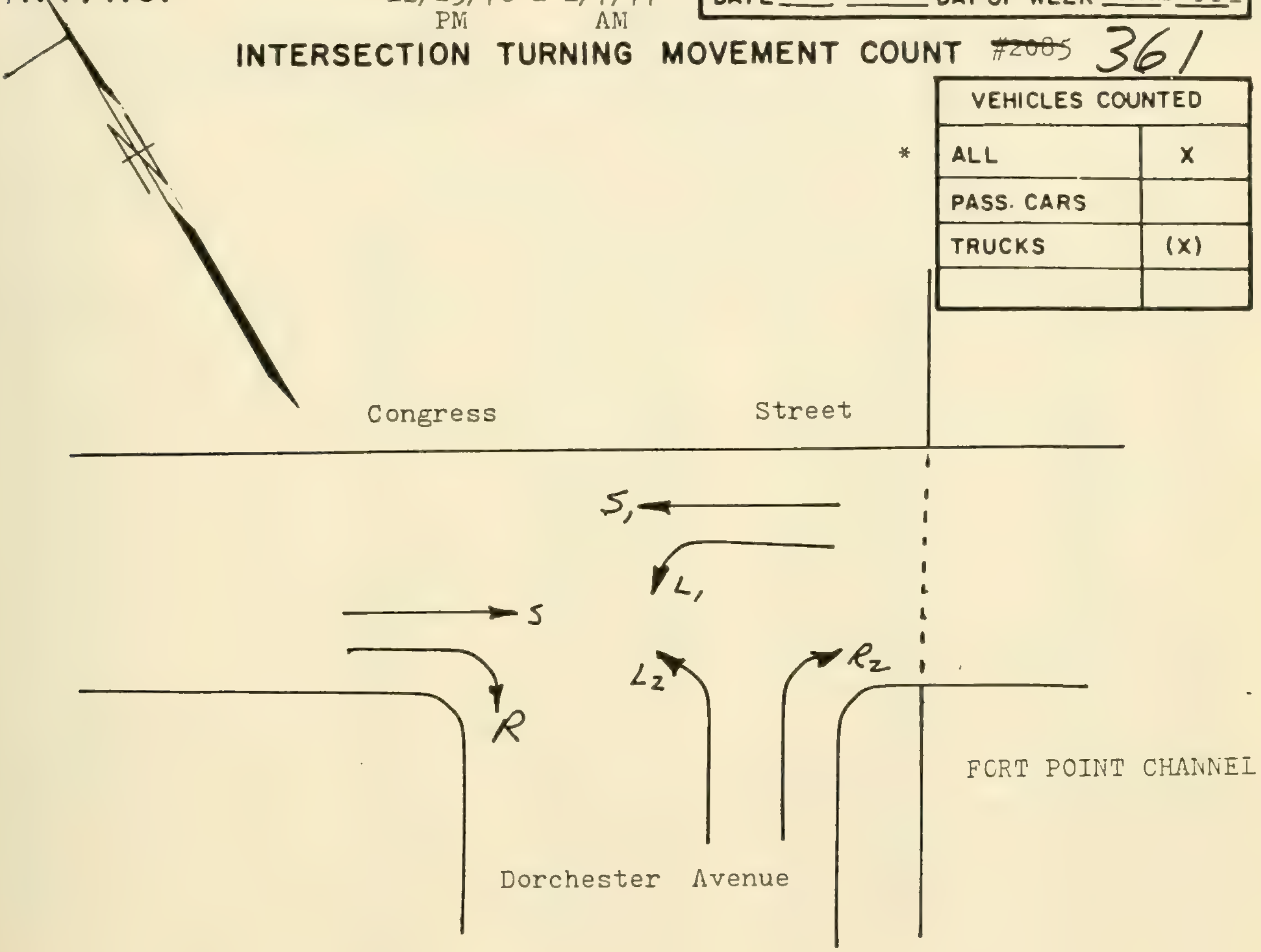
PLANNING ENGINEERING & DEVELOPMENT

CITY	Boston Proper
INTERSECTION	Congress Street & Dorchester Avenue
DATE	*
DAY OF WEEK	Thur-Fri

NT. NO. * 12/23/76 & 1/7/77
PM AM

INTERSECTION TURNING MOVEMENT COUNT ~~#2085~~ 361

VEHICLES COUNTED	
ALL *	X
PASS. CARS	
TRUCKS	(X)



WEATHER
snow-am
fair-pm

COUNT TAKEN BY
J.M.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 hours

STREET		ENTERING VOLUME	FLOW PERCENT
Congress St.	EB	5337	45.5
Congress St.	WB	2476	21.1
Dorchester Ave.	NB	3920	33.4
TOTAL		11733	100.0%

COMMENTS

AFFIC MOVEMENT SUMMARY TABLE

ION Congress St. * Dorchester Ave. CITY OR TOWN 'Boston Proper

E * DAY OF WEEK * WEATHER Fair-am Snow-pm RECORDER J.M

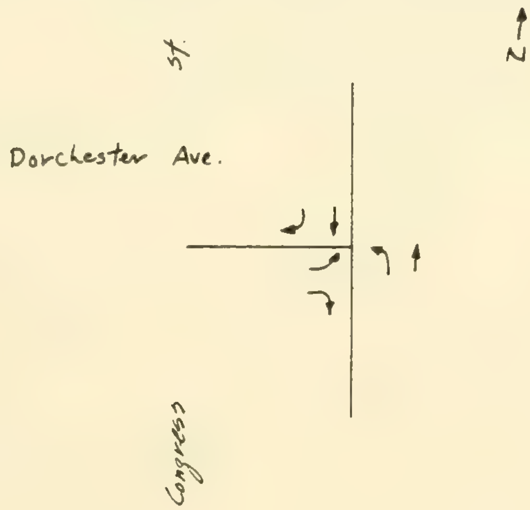
TIME STARTS __ M	Congress		Street				Dorchester Av.						TOTAL HALF HOUR TALLY
	Eastbound			Westbound			Northbound						
	S		R	L_1		S_1	L_2		R_2				
7:00-7:30	121		111	13		25	86		14				370
7:30-8:00	201		141	13		52	138		22				567
8:00-8:30	182		121	20		65	157		46				591
8:30-9:00	170		98	26		57	158		40				549
9:00-9:30	88		62	35		50	111		23				369
9:30-10:00	90		65	27		40	111		20				353
10:00-10:30	83		71	27		46	88		22				337
10:30-11:00	74		66	25		36	103		22				326
11:00-11:30	78		62	22		60	106		20				348
11:30-12:00	80		66	20		81	110		22				379
12:00-12:30	152		143	61		106	198		37				697
12:30-1:00	126		102	37		73	175		36				549
1:00-1:30	110		114	52		75	204		30				585
1:30-2:00	128		136	39		78	185		26				592
2:00-2:30	148		118	69		123	222		18				698
2:30-3:00	112		113	47		101	171		20				564
3:00-3:30	117		133	62		87	209		24				632
3:30-4:00	132		193	64		100	230		24				743
4:00-4:30	131		211	74		75	188		16				693
4:30-5:00	103		234	54		119	163		9				682
5:00-5:30	90		192	46		80	154		12				574
5:30-6:00	85		184	40		74	141		9				533
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	2601		2736	873		1603	3408		512				GRAND TOTAL
TOTAL OF L.S & R	5337			2476			3920						11,733

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

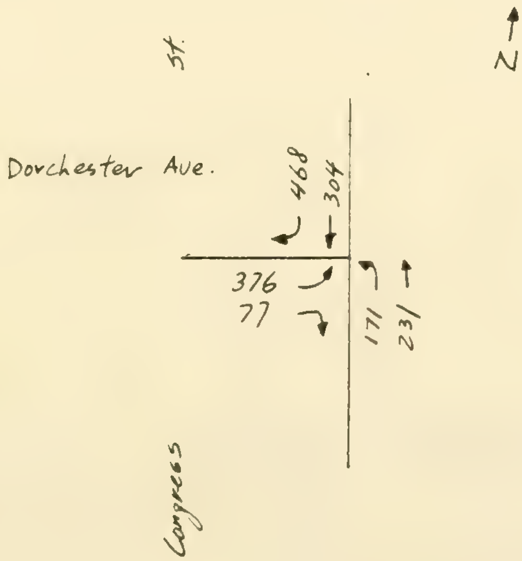
JOB *International Place* JOB No. *0923*
LOCATION ______ SHEET ______ OF ______
CALCULATED BY *BG* DATE ______
CHECKED BY ______ DATE ______
TITLE *Turning Movement Counts*

AM

Source: Third Harbor EIR



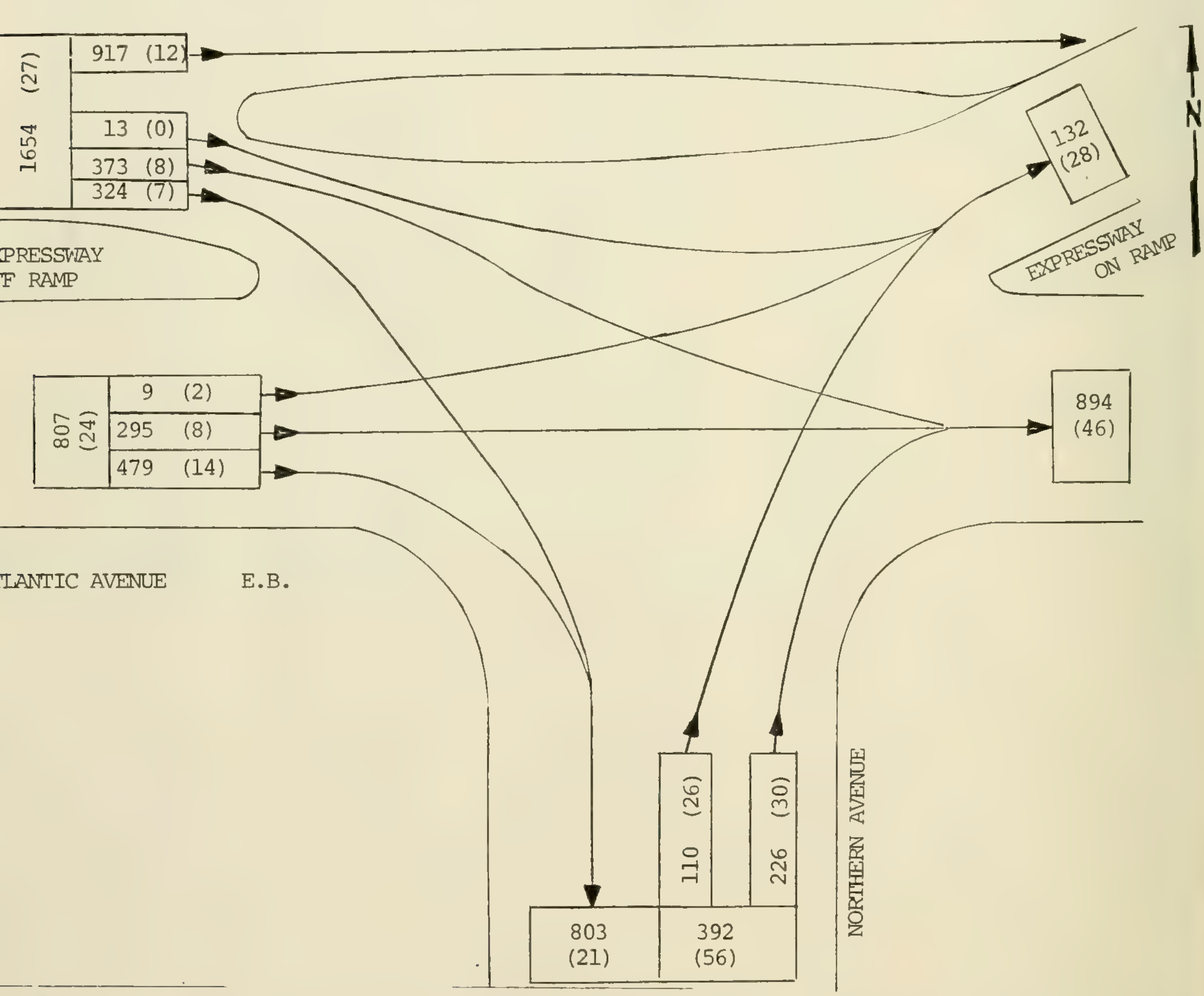
PM



Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 11/24/81 DAY of WEEK Tuesday
INTERSECTION Atlantic Ave., Northern Ave. & Expressway Ramps JOB No. 0121-10



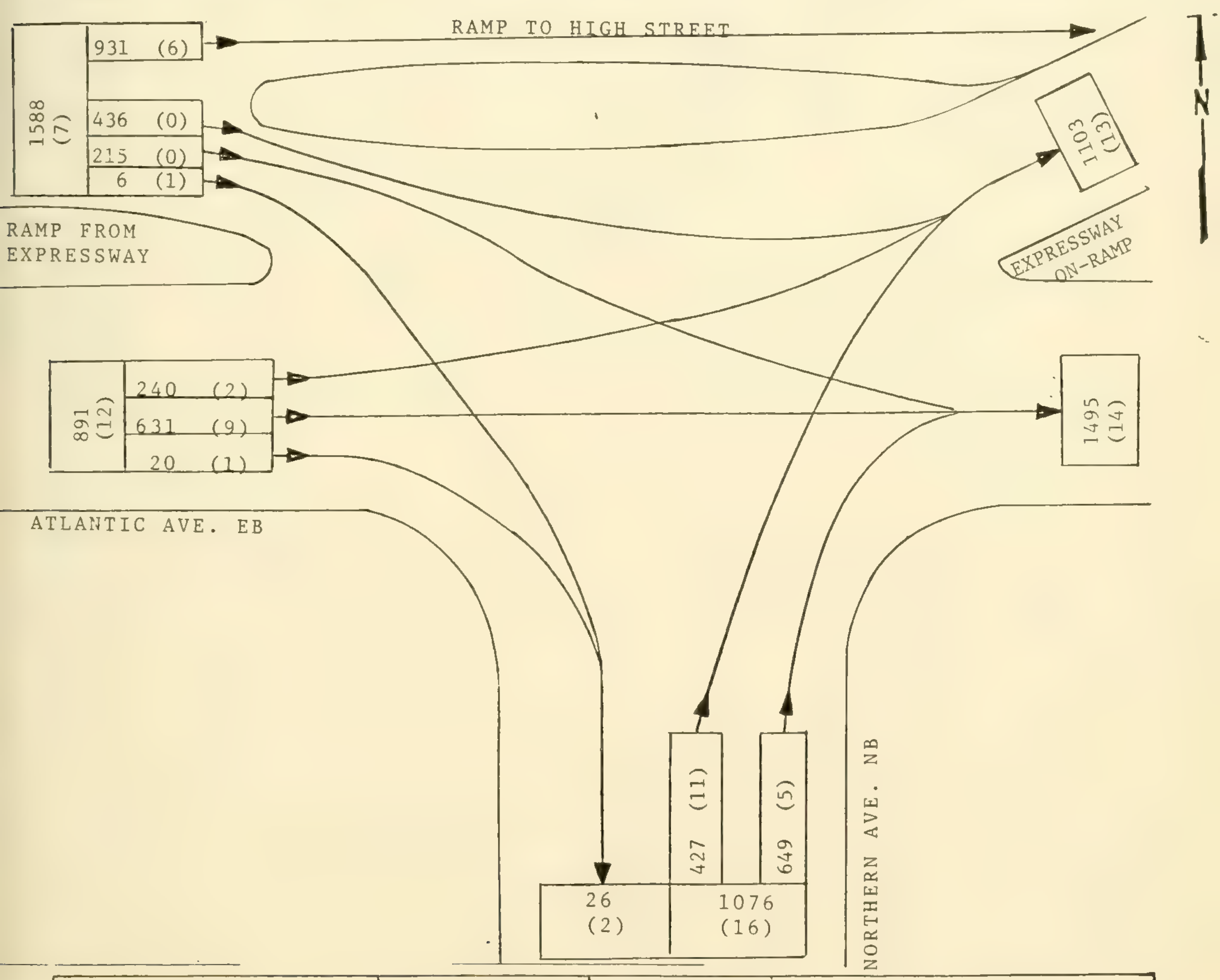
STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
ATLANTIC AVENUE E.B.	807 (24)	28.3%	7:30AM - 8:30AM
NORTHERN AVENUE N.B.	392 (56)	13.7%	
OFF RAMP FROM EXPRESSWAY	737 (15)	25.8%	AM Peak Hour
RAMP TO HIGH STREET	917 (12)	32.2%	
			VEHICLES COUNTED
			ALL VEHICLES XXX
			TRUCKS (XX)
TOTAL	2853 (107)	100%	PERCENT TRUCKS 3.7%

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON DATE 11-24-81 and 12-09-81 DAY of WEEK Tuesday Wednesday

INTERSECTION Northern Ave. @ Atlantic Ave. JOB No. 0121-10



STREET		ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Northern Ave.	NB	1076 (16)	30.3%	
Atlantic Ave.	EB	891 (12)	25.1%	4:15 PM to 5:15 PM
Ramp from				
Expressway	EB	1588 (7)	44.6%	PM Peak Hour
				VEHICLES COUNTED
				ALL VEHICLES XXX
				TRUCKS (XX)
TOTAL		3555 (35)	100%	PERCENT TRUCKS 1.0 %

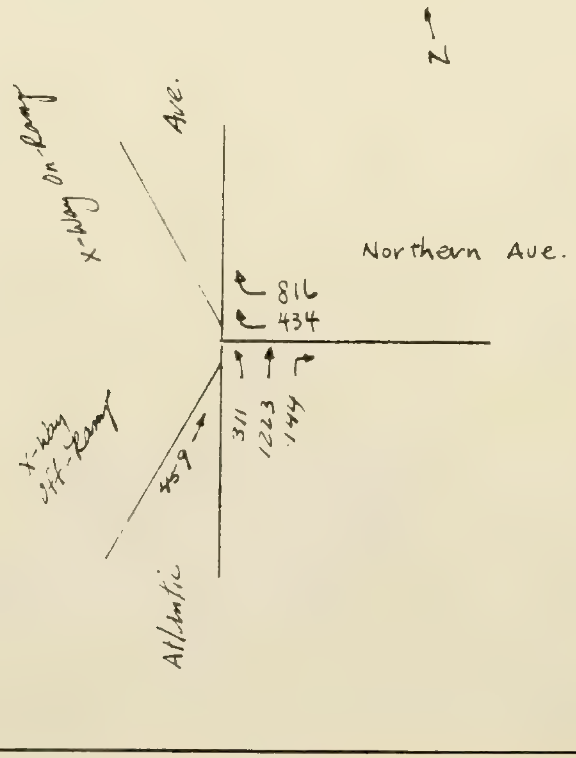
Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB International Place JOB No. 0923
LOCATION ______ SHEET ____ OF ____
CALCULATED BY BG DATE ______
CHECKED BY ______ DATE ______
TITLE Turning Movement Counts

AM

Source: Third Harbor EIR

PM



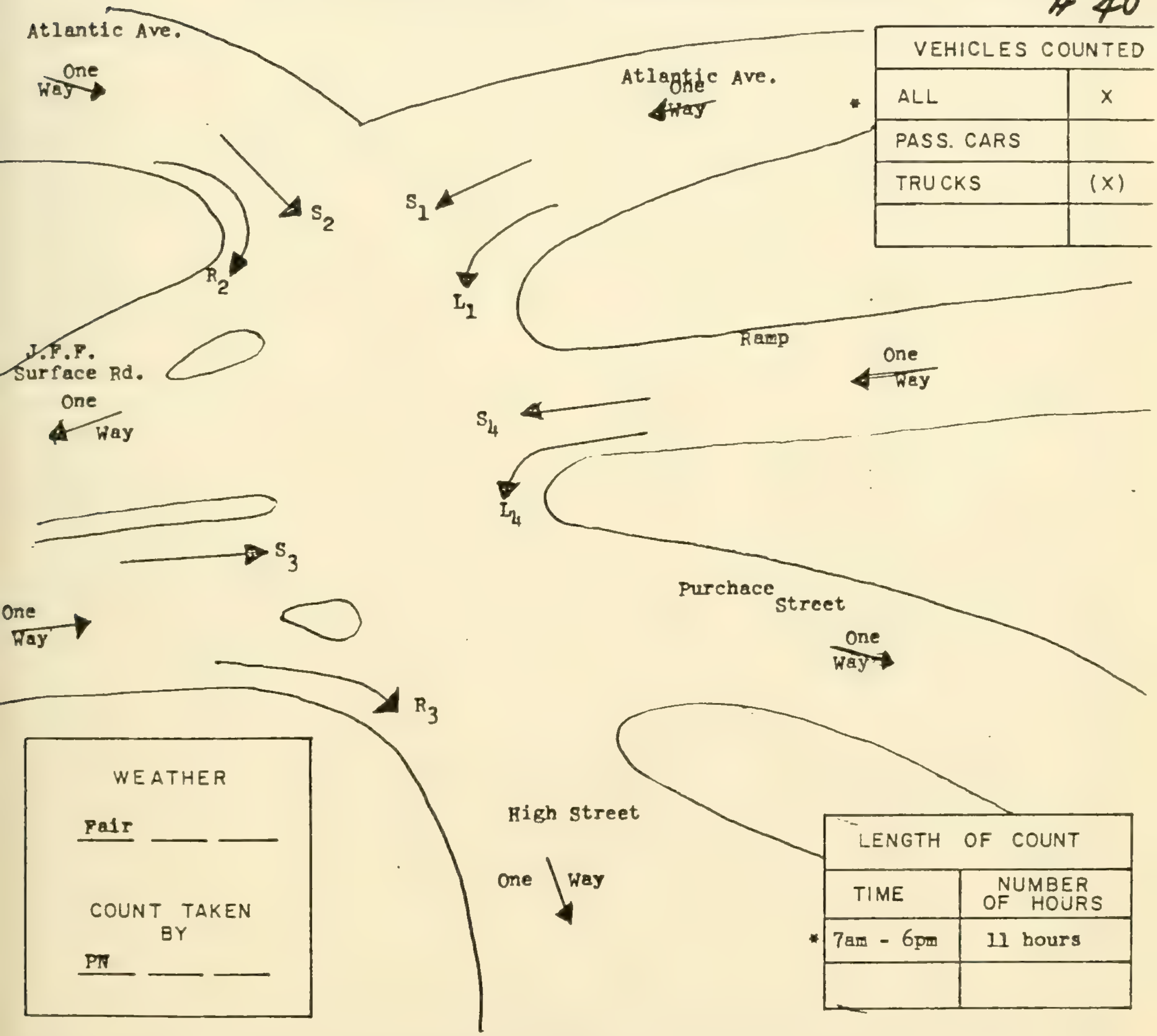
Traffic Control Systems
Planning, Engineering, Construction & Maintenance
Brighton, Ma. Tel. (617) 782-9757

INT. NO. 74

CITY	Boston Proper
INTERSECTION	Atlantic Ave., High Street & J.F.F. Surface Road
DATE	10/30 & 31/ 79
DAY OF WEEK	Tue & W

INTERSECTION TURNING MOVEMENT COUNT

40



VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)

WEATHER

Fair

COUNT TAKEN BY

PN

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am - 6pm	11 hours

STREET	ENTERING VOLUME	FLOW PERCENT
Atlantic Ave. NB	6204	26.6
Atlantic Ave. WB	3145	13.5
Surface Rd. SB	6109	26.3
Ramp NB	7827	33.6
TOTAL	23285	100.0 %

COMMENTS

Planning, Engineering, Construction, & Maintenance
Brighton, Ma. Tel. (617) 782-9757

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION Atlantic Ave. High St. & J.F.E. Surface Rd. CITY OR TOWN Boston Proper

DATE 10/30 & 31/79 DAY OF WEEK Tue. & Wed WEATHER Fair RECORDER PW

#40

TIME STARTS __ M	Atlantic Ave. Northbound			Atlantic Ave. Westbound			Surface Rd. Southbound			Ramp Northbound			TOT HALF TAL
	L_1	S_1			S_2	R_2		S_3	R_3	L_4	S_4		
7:00-7:30	52	83			184	0		218	21	100	192		85
7:30-8:00	82	106			190	1		196	23	154	248		100
8:00-8:30	123	182			210	1		271	16	218	296		131
8:30-9:00	123	159			145	1		233	22	261	339		128
9:00-9:30	144	166			139	1		183	20	215	272		114
9:30-10:00	130	102			109	0		174	36	148	224		9
10:00-10:30	142	142			100	2		184	44	144	244		10
10:30-11:00	128	101			91	2		192	38	91	216		8
11:00-11:30	127	93			91	1		185	25	90	149		7
11:30-12:00	115	93			102	0		250	28	121	181		8
12:00-12:30	116	81			118	1		263	32	95	170		8
12:30-1:00	147	94			106	0		225	31	83	127		8
1:00-1:30	155	72			91	1		239	26	72	153		8
1:30-2:00	167	80			117	0		235	34	85	140		8
2:00-2:30	180	114			122	0		300	22	86	168		9
2:30-3:00	171	130			126	1		285	16	74	212		10
3:00-3:30	163	196			170	1		308	15	46	315		12
3:30-4:00	152	237			215	0		401	9	99	395		15
4:00-4:30	165	206			142	1		317	11	35	340		12
4:30-5:00	208	205			198	0		351	23	62	394		14
5:00-5:30	255	191			203	0		345	2	39	393		14
5:30-6:00	181	145			162	0		253	7	33	308		10
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	3226	2978			3131	14		5608	501	2351	5476		GRA TOT
TOTAL OF	6204			3145			6109			7827			23

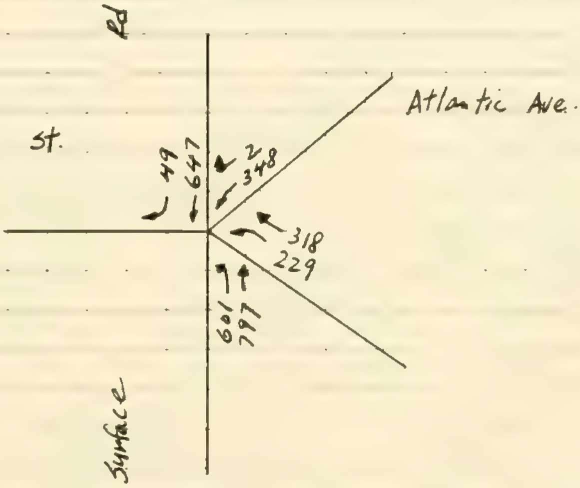
VH

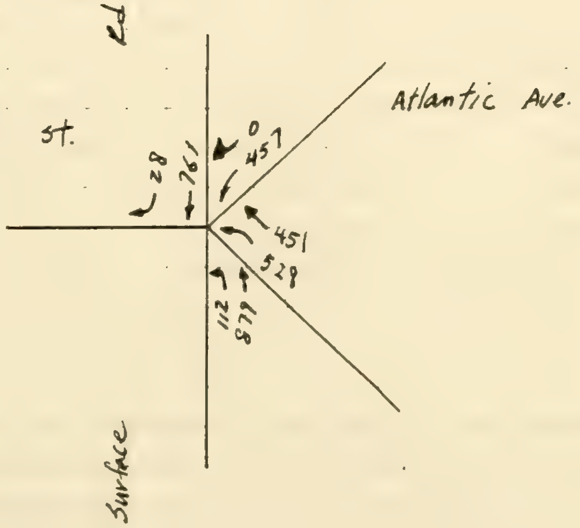
Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923
LOCATION: SHEET OF
CALCULATED BY: BG DATE
CHECKED BY: DATE
TITLE: Turning Movement Counts

AM

Source: Third Harbor EIR

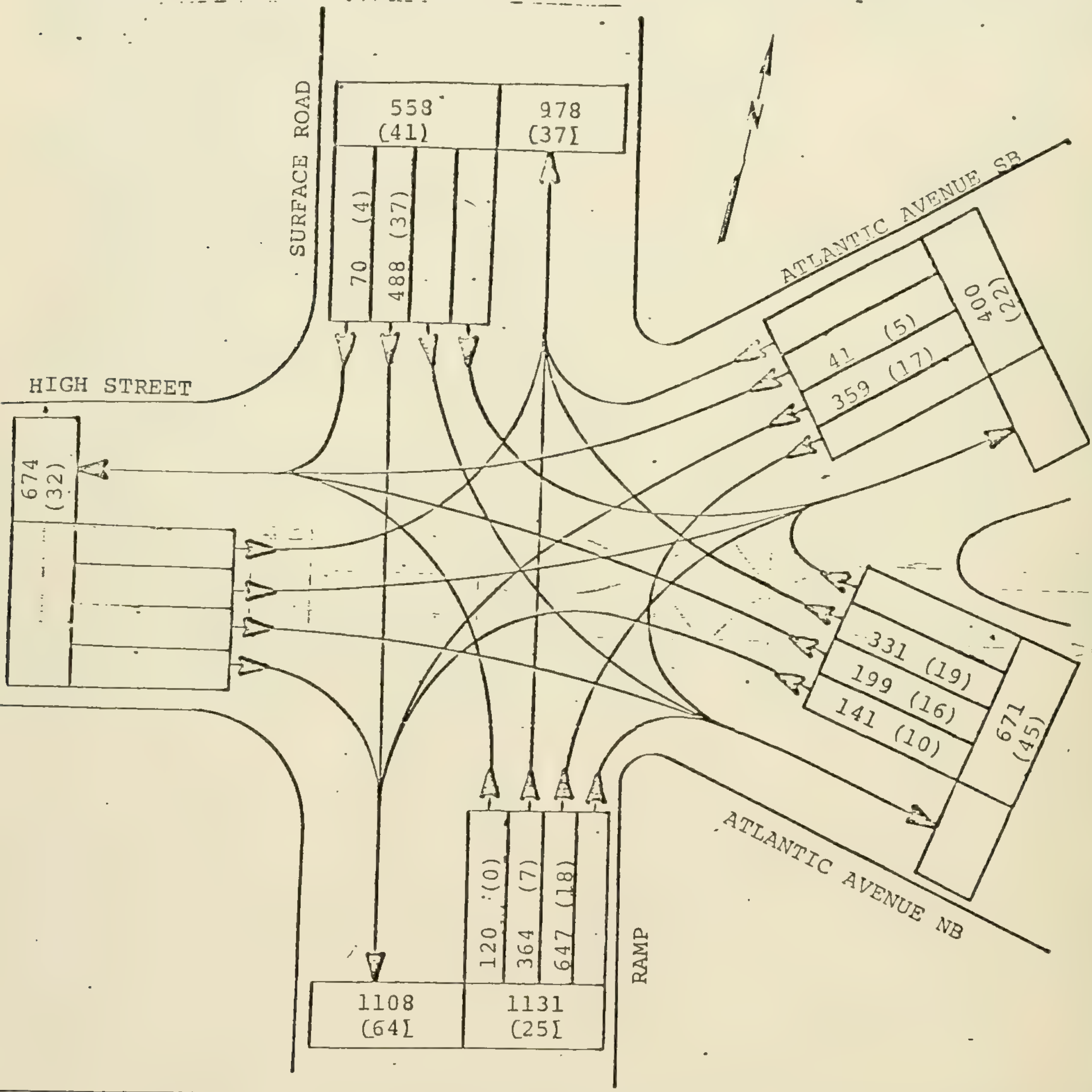




INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/10/80 DAY of WEEK Mon.

INTERSECTION High St. & Surface Rd. & Atlantic Ave. & Ramp



STREET		ENTERING VOLUME	PERCENT of FLOW	LENGTH of COUNT Time	Number of Hours
amp	(NB)	1131 (25)	41.0		AM
tlantic Ave.	(NB)	671 (45)	24.3	8:00-9:00AM	PEAK HOUR
tlantic Ave.	(SB)	400 (22)	14.5		
urface Rd.	(SB)	558 (41)	20.2		
				5% Trucks	
				VEHICLES COUNTED	
				ALL	XXX
TOTAL		2760 (133)	100%	133 TRUCKS	(XX)

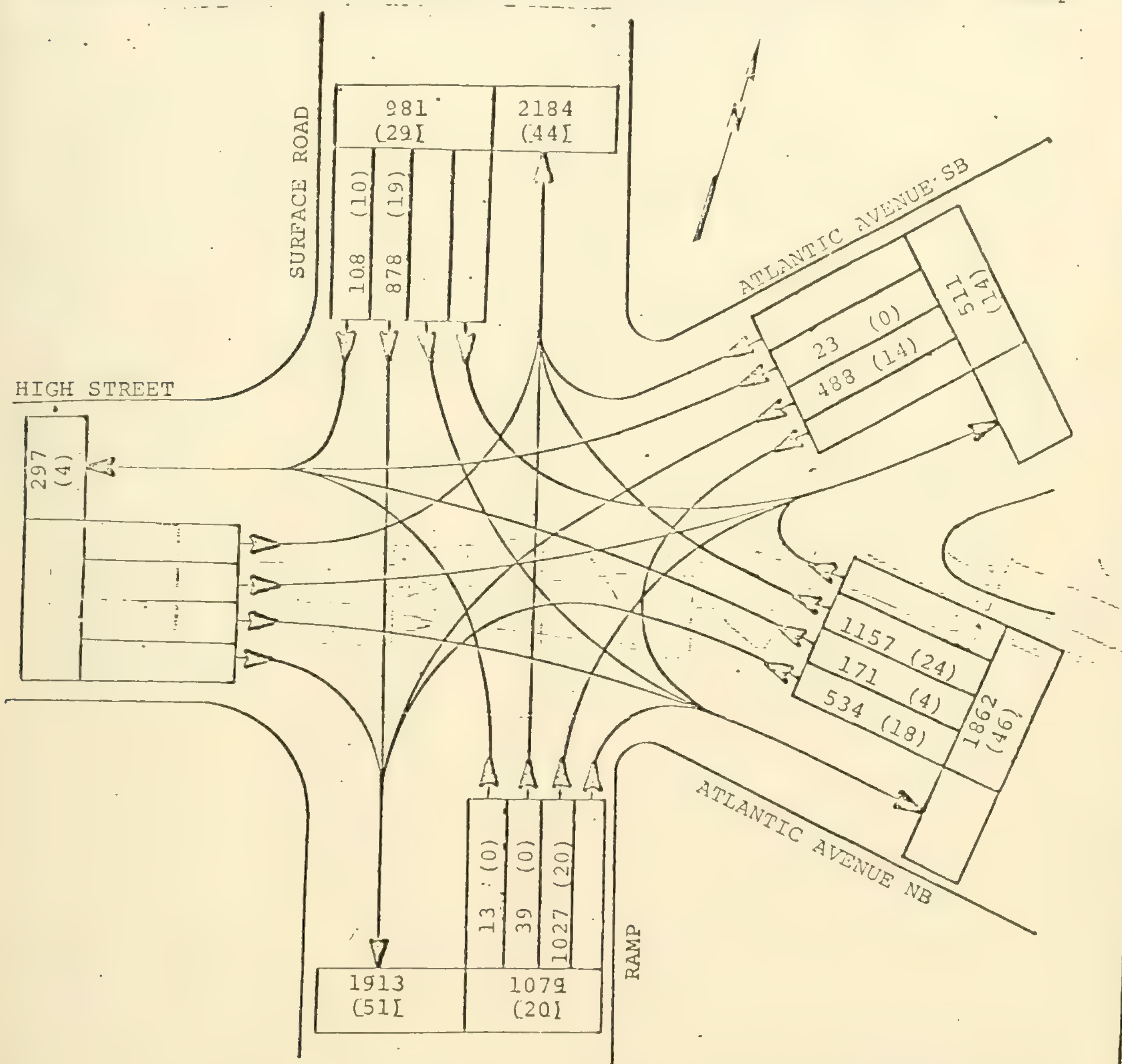
Boston, Massachusetts

INTERSECTION TURNING MOVEMENT COUNT

VH #80-101

CITY BOSTON, MA DATE 11/10/80 DAY of WEEK Monday

INTERSECTION High St. & Surface Rd. & Atlantic Ave. & Purchase St. & Ramp



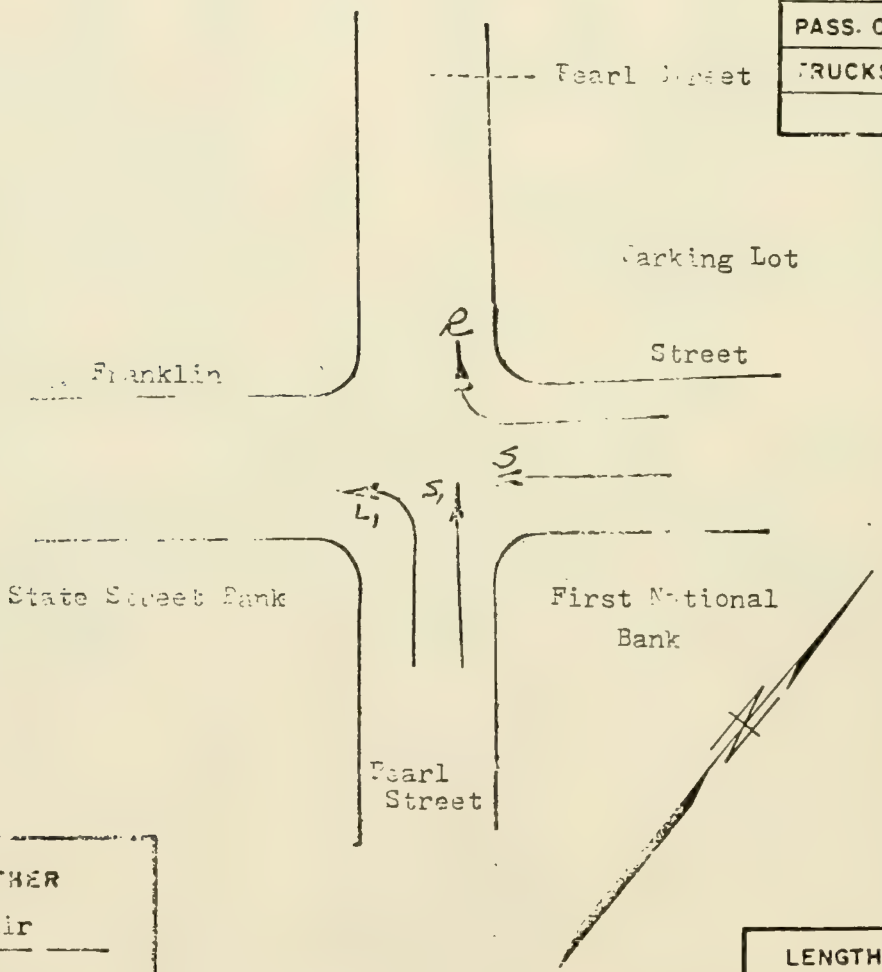
STREET		ENTERING VOLUME	PERCENT of FLOW	LENGTH of COUNT Time	Number of Hours
Ramp	(NB)	1079 (20)	24.4	4:45-5:45PM	PM PEAK HOUR
Atlantic	(NB)	1862 (46)	42.0		
Atlantic	(SB)	511 (14)	11.5		
Surface Rd.	(SB)	931 (29)	22.1		
				2% Trucks	
				VEHICLES COUNTED	
				ALL	XXX
TOTAL		4433 (99)	100.0%	TRUCKS	(XX)

CITY	Boston Proper
INTERSECTION	Franklin Street & Pearl Street
DATE	8/10/79
DAY OF WEEK	Friday

INTERSECTION TURNING MOVEMENT COUNT

\# 57 BRA

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER

Fair

COUNT TAKEN BY

E.H.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 hours

STREET		ENTERING VOLUME	FLOW PERCENT
Franklin St.	[illegible]	[illegible]	51
Pearl St.	[illegible]	[illegible]	[illegible]

COMMENTS

STA.NO. 57
BRA

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION Franklin Street & Pearl Street CITY OR TOWN Boston Proper

DATE 8/10/79 DAY OF WEEK Friday WEATHER Fair RECORDER E.H.

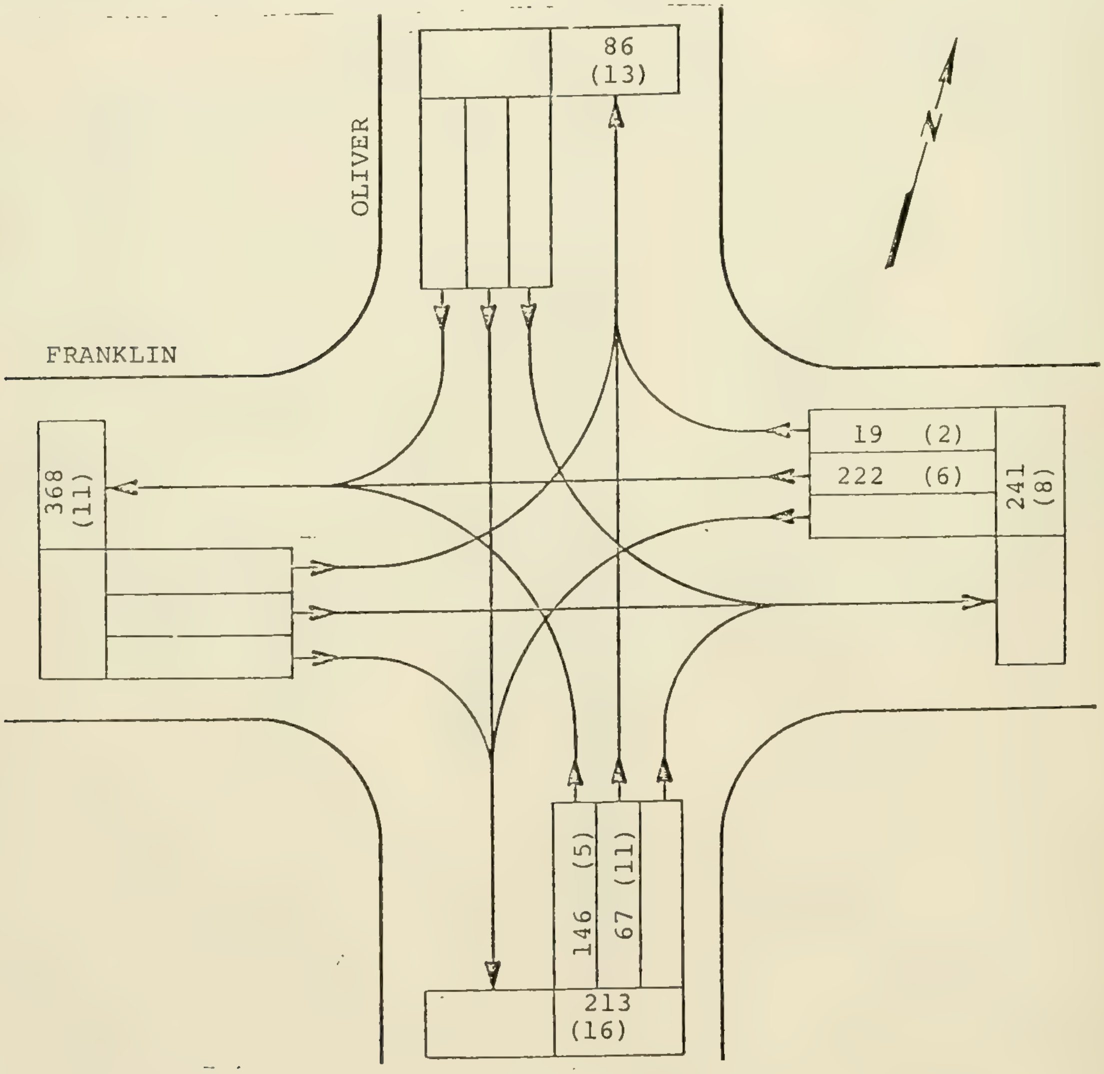
TIME STARTS __ M	Franklin St. Westbound			Pearl St. Northbound									TOTAL HALF HOURLY TALLY
	S		R	L		S							
7:00-7:30	31		36	21		28							116
7:30-8:00	58		61	43		71							233
8:00-8:30	120		98	76		119							413
8:30-9:00	106		58	63		114							341
9:00-9:30	48		86	45		88							317
9:30-10:00	111		48	34		82							275
10:00-10:30	103		53	38		71							265
10:30-11:00	119		36	42		101							298
11:00-11:30	117		32	56		83							288
11:30-12:00	114		45	44		91							294
12:00-12:30	98		51	32		73							254
12:30-1:00	108		43	64		61							276
1:00-1:30	95		49	64		61							269
1:30-2:00	83		61	73		55							272
2:00-2:30	81		69	69		62							281
2:30-3:00	66		39	72		69							246
3:00-3:30	73		42	39		98							252
3:30-4:00	59		49	48		87							243
4:00-4:30	73		56	55		93							277
4:30-5:00	71		78	64		121							340
5:00-5:30	53		74	79		132							338
5:30-6:00	39		58	53		94							244
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	1882		1232	1169		1849							GRAND TOTAL
TOTAL OF L.S & R.	3114			3018									6132

vhd Vanasse/Hangen Design, Inc.
Boston, Massachusetts

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/13/80 DAYofWEEK Thur.

INTERSECTION Franklin St. & Oliver St.



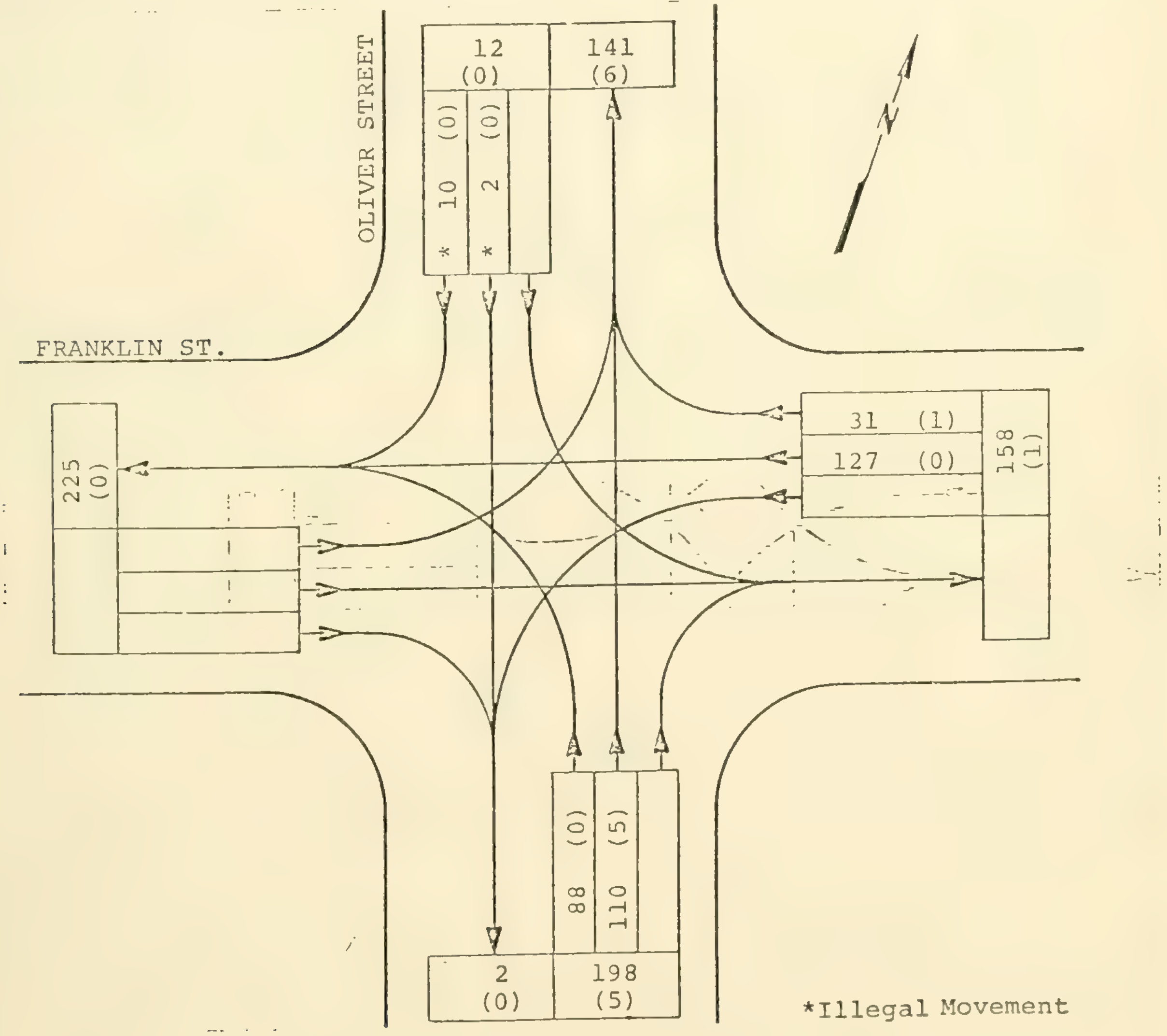
STREET		ENTERING VOLUME	PERCENT of FLOW	LENGTH of COUNT Time	Number of Hours
Franklin St.	(WB)	241 (8)	53.1		AM
Oliver St.	(NB)	213 (16)	46.9	8:00-9:00AM	PEAK HOUR
				5% Trucks	
				VEHICLES COUNTED	
				ALL	XXX
TOTAL		454 (24)	100%	TRUCKS	(XX)

VH #80-101

vhd Vanasse/Hangen Design, Inc.
Boston, Massachusetts

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/13/80 DAY of WEEK Thur.
INTERSECTION Franklin St. & Oliver St.



*Illegal Movement

STREET		ENTERING VOLUME	PERCENT of FLOW	LENGTH of COUNT	
				Time	Number of Hours
Franklin St.	(WB)	158 (1)	42.9	4:15-5:15PM	PM PEAK HOUR
Oliver St.	(NB)	198 (5)	53.8		
Oliver St. *	(SB)	12 (0)	* 3.3		
				2% Trucks	
				VEHICLES COUNTED	
				ALL	XXX
TOTAL		368 (6)	100%	TRUCKS	(XX)

CONSULTING ENGINEERS ARCHITECTS
AND PLANNERS

City BOSTON - PROPER
Intersection FRANKLIN ST & OLIVER S

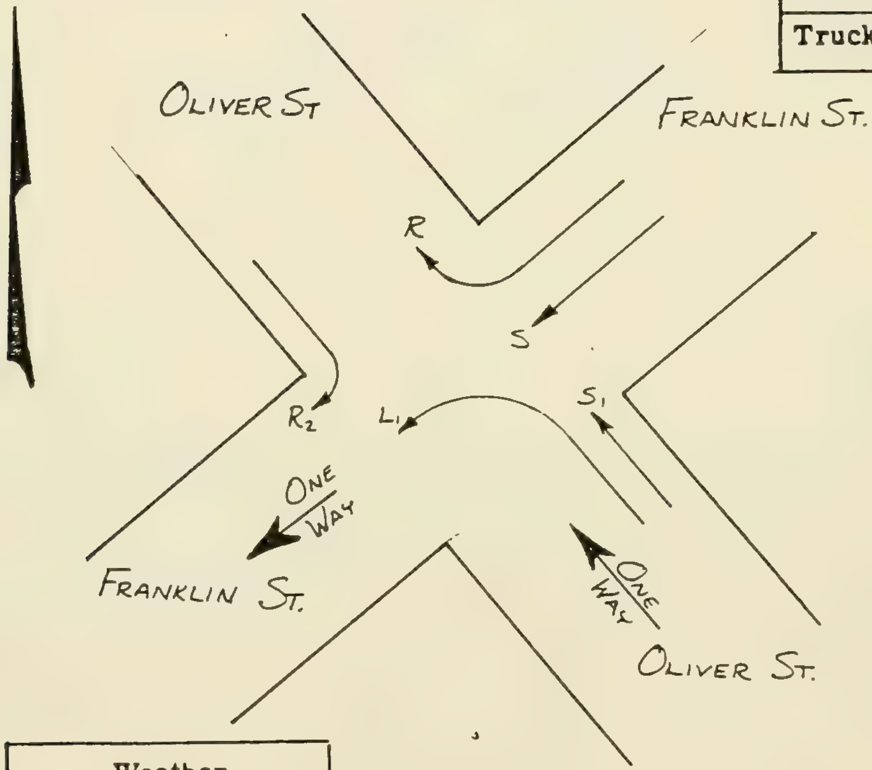
INT. NO. 100 (BTPD# 553) Date 5/20/83 Day of Week FRIDAY

OK

INTERSECTION TURNING MOVEMENT COUNT

553

Vehicles Counted	
All	X
Pass. Cars	
Trucks	



Weather
CLOUDY/FOG

Count Taken By
JOAN SCHUBERT

Length of Count	
Time	Number of Hours
7AM - 6PM	11 HRS.

Street	Entering Volume	Flow Percent	Comments
FRANKLIN ST. (WB)	2307	45 %	
OLIVER ST. (NB)	2247	43 %	
OLIVER ST. (SB)	628	12 %	
Total	5182	100%	

553

PARK SQUARE ASSOCIATES, INC.

TRAFFIC MOVEMENT SUMMARY TABLE

Location FRANKLIN ST & OLIVER ST. City or Town BOSTON - PROPER

Date 5/20/83 Day of Week FRIDAY Weather CLDY Recorder JS

Time Starts 7:00 AM	Franklin St. (WB)		Oliver St. (NB)		Oliver St. (SB)								Total Half Hour Tally
	S	R	L_1	S_1	R_2								
7:00-7:30	39	7	40	35	4								125
7:30-8:00	60	10	51	51	10								182
8:00-8:30	111	41	99	84	14								349
8:30-9:00	82	44	56	75	12								269
9:00-9:30	95	37	60	85	20								297
9:30-10:00	85	32	34	84	24								259
10:00-10:30	80	29	30	67	27								233
10:30-11:00	73	29	49	60	35								246
11:00-11:30	95	38	56	97	17								303
11:30-12:00	102	33	38	51	22								246
12:00-12:30	99	31	48	68	27								273
12:30-1:00	81	39	31	65	18								234
1:00-1:30	117	22	35	50	30								254
1:30-2:00	91	34	32	43	38								238
2:00-2:30	83	16	17	43	27								186
2:30-3:00	66	13	24	34	52								189
3:00-3:30	74	21	41	34	55								225
3:30-4:00	69	20	27	31	24								171
4:00-4:30	66	18	26	66	24								200
4:30-5:00	52	21	35	81	40								229
5:00-5:30	64	17	34	86	52								253
5:30-6:00	55	16	32	62	56								221
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	1739	568	895	1352	628								GRAND TOTAL
Total of L S & R	2307		2247		628								5182

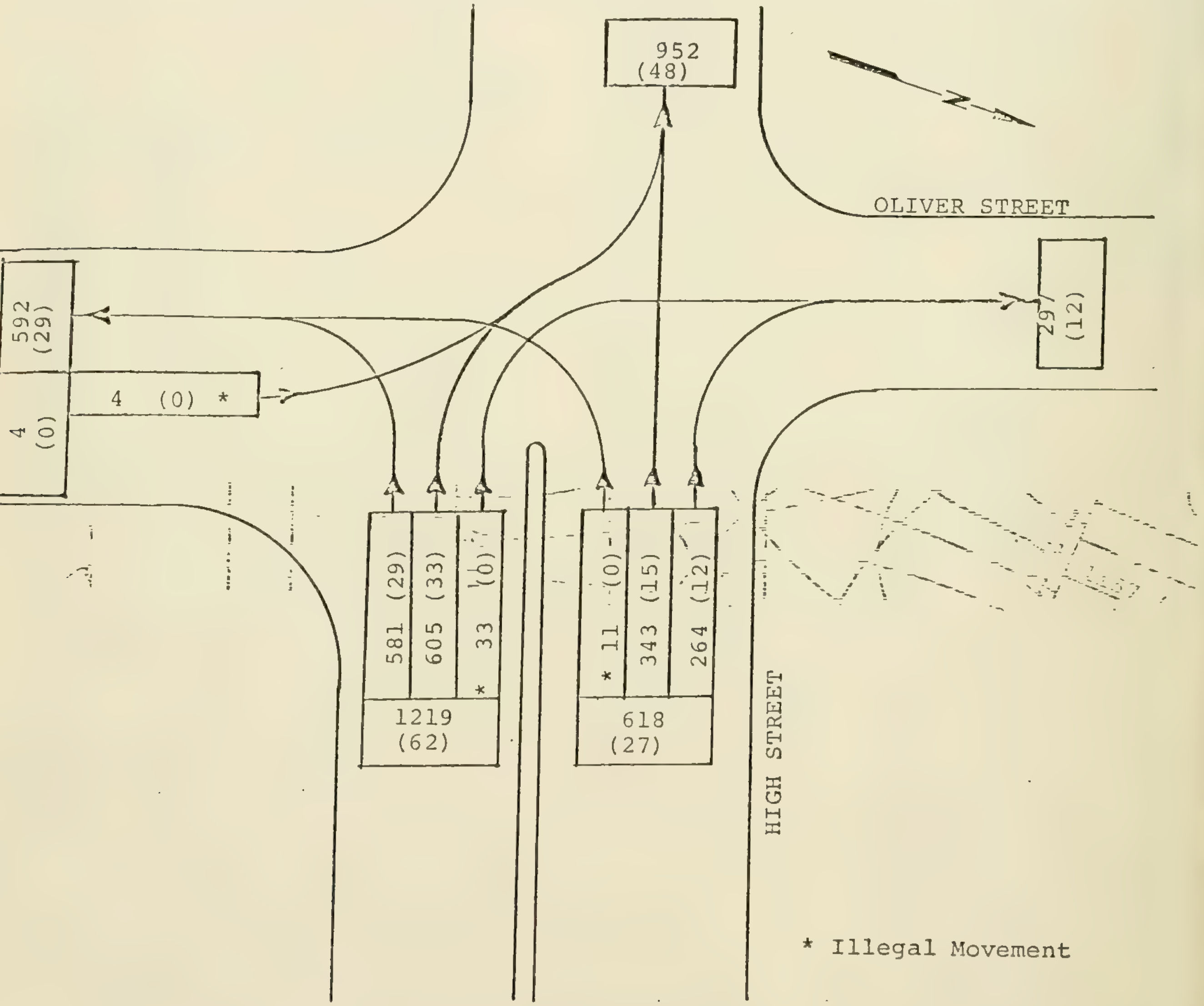
Vanasse/Hangen Design, Inc.
Boston, Massachusetts

VH .30-101

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/12/80 DAY of WEEK Wed.

INTERSECTION High St. & Oliver St.



STREET		DIRECTIONAL DISTRIBUTION	PERCENT of A.D.T.	TIME of COUNT
Ramp	WB	1219 (62)	66.2	AM PEAK HOUR
High St.	WB	618 (27)	33.6	
Oliver St.	NB	4 (0)	.2	8:00A-9:00A
				VEHICLES COUNTED
				ALL VEHICLES XXX
				TRUCKS (XX)
TOTAL		1841 (89)	100.0	PERCENT TRUCKS 4.8 %

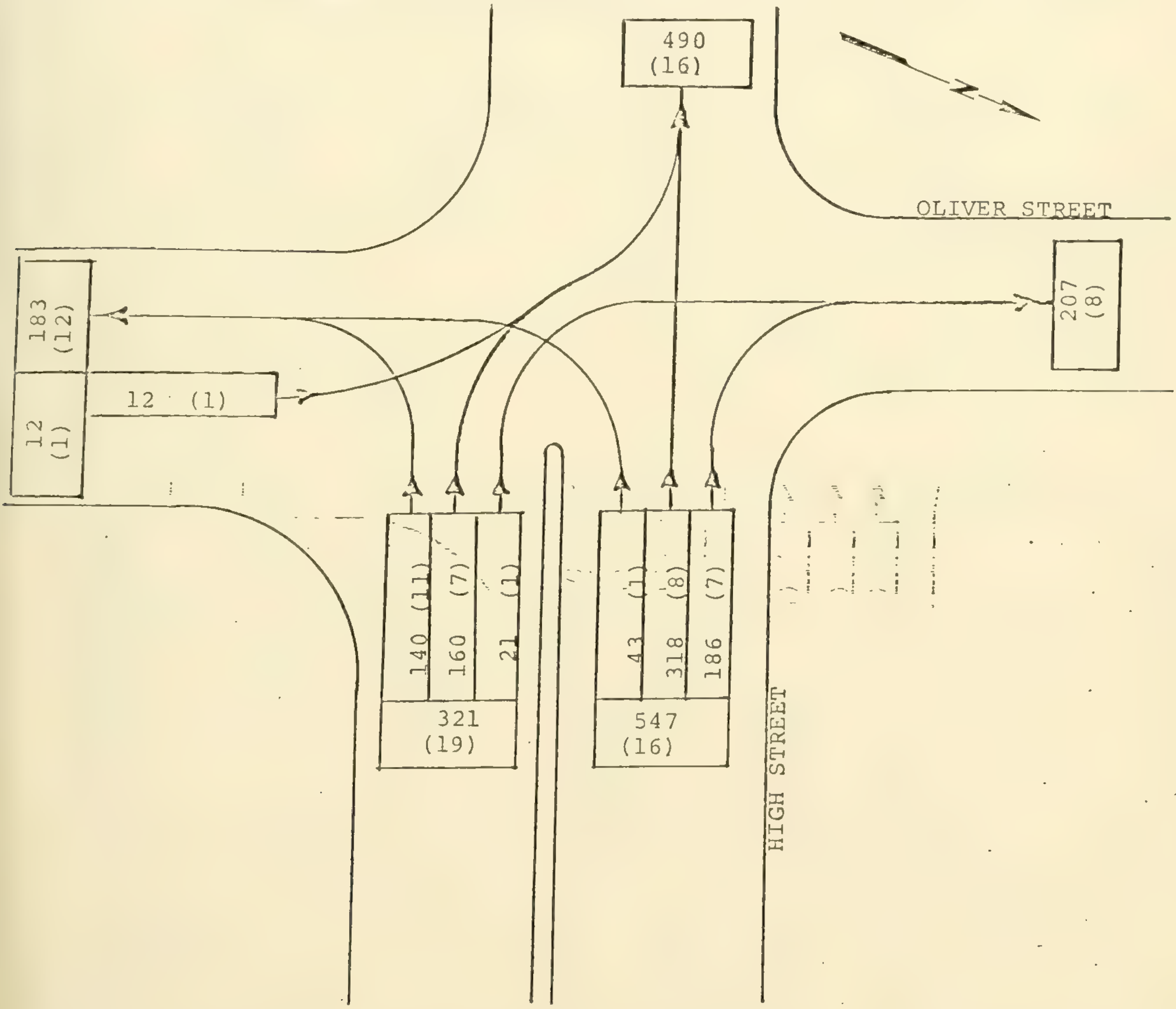
vhd Vanasse/Hangen Design, Inc.
Boston, Massachusetts

VH #80-101

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/12/80 DAYofWEEK Wed.

INTERSECTION High St. & Oliver St.



STREET		DIRECTIONAL DISTRIBUTION	PERCENT of A.D.T.	TIME of COUNT
Ramp	WB	321 (19)	36.5	
High St.	WB	547 (16)	62.2	PM PEAK HOUR
Oliver St.	NB	12 (1)	1.3	
				4:30-5:30 PM
				VEHICLES COUNTED
				ALL VEHICLES XXX
				TRUCKS (XX)
TOTAL		1201 (36)	100.0	PERCENT TRUCKS 4.1 %

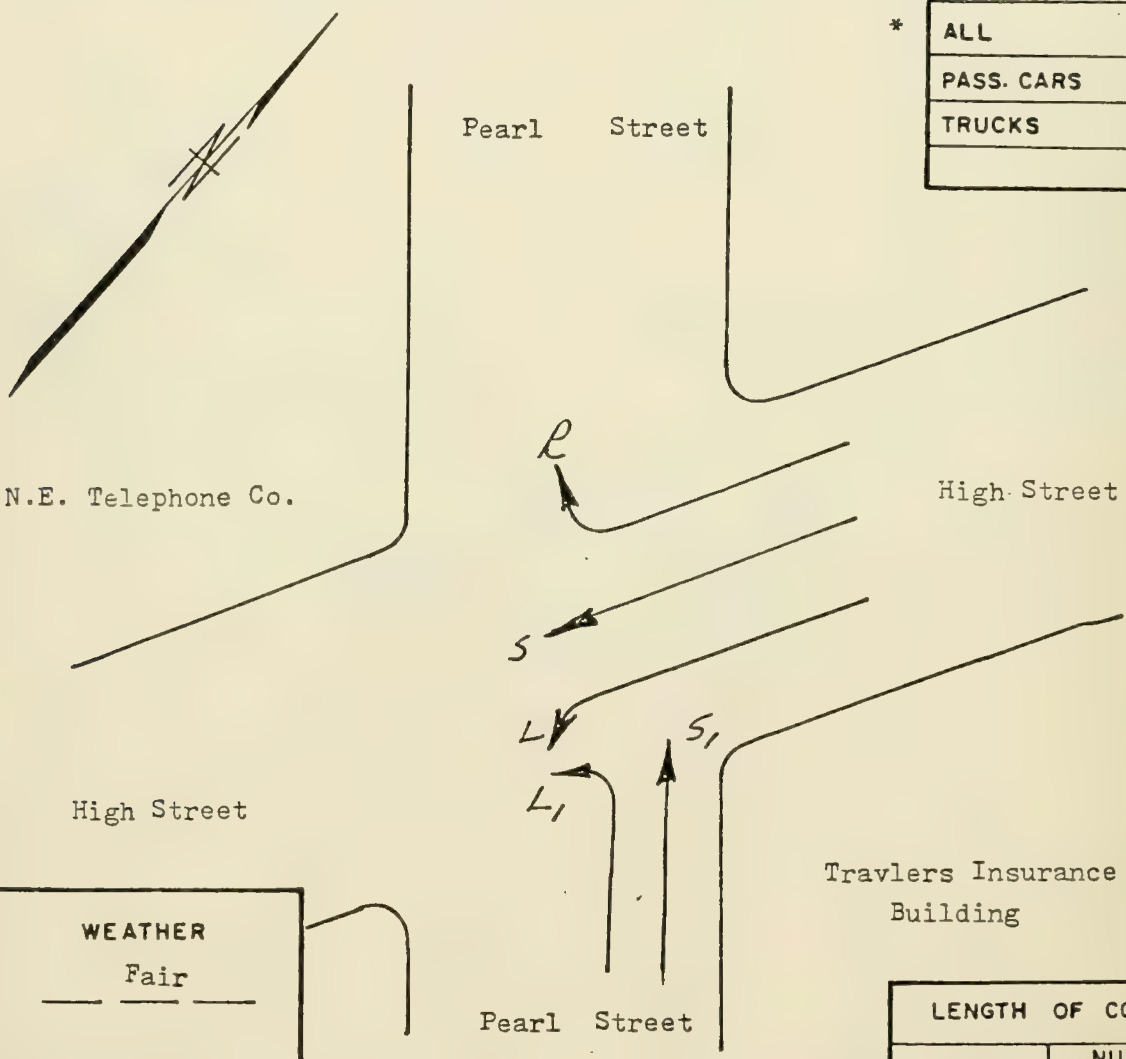
PLANNING ENGINEERING & DEVELOPMENT

INT. NO.

CITY: Boston Proper
INTERSECTION: High Street & Pearl Street
DATE: 9/3/79 DAY OF WEEK: Friday

INTERSECTION TURNING MOVEMENT COUNT #58 BRA

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER
Fair
COUNT TAKEN BY
E.B.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 hours

STREET		ENTERING VOLUME	FLOW PERCENT
High St.	SB	7083	95
Pearl St.	WB	405	5
TOTAL		7488	100%

COMMENTS

PLANNING ENGINEERING & DEVELOPMENT

STA.NO. 58
BRA

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION High Street & Pearl Street CITY OR TOWN Boston Proper

DATE 9/3/79 DAY OF WEEK Friday WEATHER Fair RECORDER E.B.

TIME STARTS __M	High Street Southbound			Pearl Street Westbound			TOTAL HALF HOURLY TALLY
	L	S	R	L		S	
7:00-7:30	0	191	45	7		5	248
7:30-8:00		247	96	12		6	361
8:00-8:30		368	141	15		4	528
8:30-9:00		329	207	11		13	560
9:00-9:30		303	130	4		7	444
9:30-10:00		202	83	9		8	302
10:00-10:30		207	79	8		8	302
10:30-11:00		246	89	9		9	353
11:00-11:30		254	127	14		9	404
11:30-12:00		301	164	19		12	496
12:00-12:30		266	188	21		14	489
12:30-1:00		233	144	14		15	406
1:00-1:30		209	63	3		10	285
1:30-2:00		187	84	6		6	283
2:00-2:30		198	58	9		7	272
2:30-3:00		205	55	6		9	275
3:00-3:30		173	72	3		8	256
3:30-4:00		163	65	10		14	252
4:00-4:30		160	51	6		7	224
4:30-5:00		216	82	10		9	317
5:00-5:30		191	43	9		11	254
5:30-6:00	0	140	28	4		5	177
6:00-6:30							
6:30-7:00							
7:00-7:30							
7:30-8:00							
8:00-8:30							
8:30-9:00							
9:00-9:30							
9:30-10:00							
10:00-10:30							
10:30-11:00							
TOTAL	0	4987	2094	209		196	GRAND TOTAL
TOTAL OF L.S & R	7083			405			748[illegible]

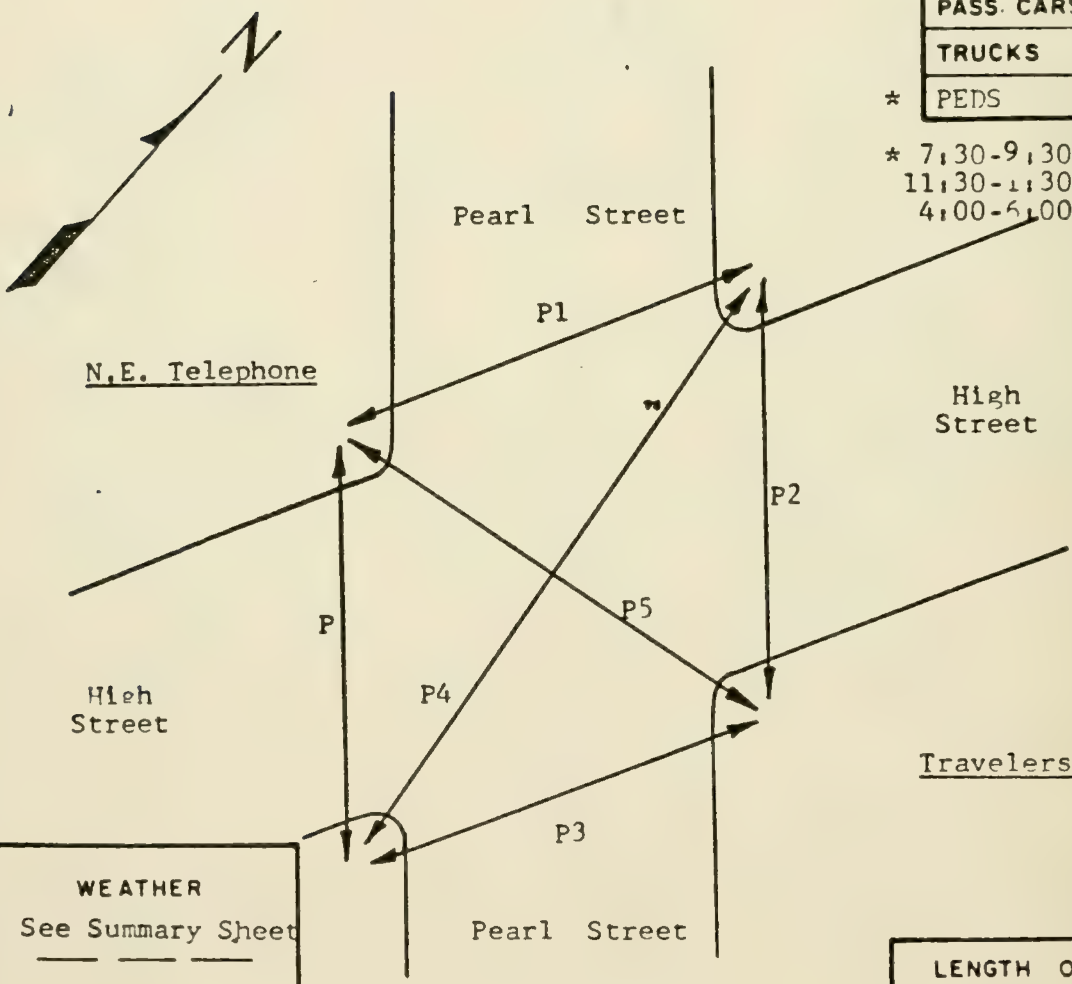
PLANNING ENGINEERING & DEVELOPMENT

CITY ______
INTERSECTION High Street & Pearl Street
DATE 2/13/70 DAY OF WEEK Friday

INTERSECTION TURNING MOVEMENT COUNT # 495

VEHICLES COUNTED	
ALL	X
PASS. CARS	
TRUCKS	(X)
* PEDS	

* 7:30-9:30 AM
11:30-1:30 PM
4:00-6:00 PM



WEATHER
See Summary Sheet

COUNT TAKEN BY
W.C.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
*	6 Hours

STREET	ENTERING VOLUME	FLOW PERCENT
TOTAL		

COMMENTS

PLANNING ENGINEERING & DEVELOPMENT — STA.NO.

PEDESTRIAN

TRAFFIC MOVEMENT SUMMARY TABL

LOCATION High Street & Pearl Street CITY OR TOWN Boston CBD

DATE 2/13/70 DAY OF WEEK Friday WEATHER See Below RECORDER W.C.

TIME STARTS __ M	See Sketch Plan												TOTAL HALF HOUR TALLY
	P	P1	P2	P3	P4	P5							
7:00-7:30													
7:30-8:00	34	92	48	26	3	7							210
8:00-8:30	67	411	173	88	9	12							760
8:30-9:00	76	310	139	119	12	21							677
9:00-9:30	35	90	70	42	5	7							249
9:30-10:00													
10:00-10:30													
10:30-11:00													
11:00-11:30													
11:30-12:00	54	129	101	79	14	4							381
12:00-12:30	130	213	185	134	28	22							712
12:30-1:00	122	244	198	121	38	19							742
1:00-1:30	157	356	268	198	18	18							1015
1:30-2:00													
2:00-2:30													
2:30-3:00													
3:00-3:30													
3:30-4:00													
4:00-4:30	35	85	63	25	5	7							220
4:30-5:00	100	190	225	78	14	22							629
5:00-5:30	108	315	180	67	24	18							712
5:30-6:00	45	53	42	33	0	0							173
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	963	2488	1692	1010	170	157							GRAND TOTAL
TOTAL OF L S & R	6480												6480

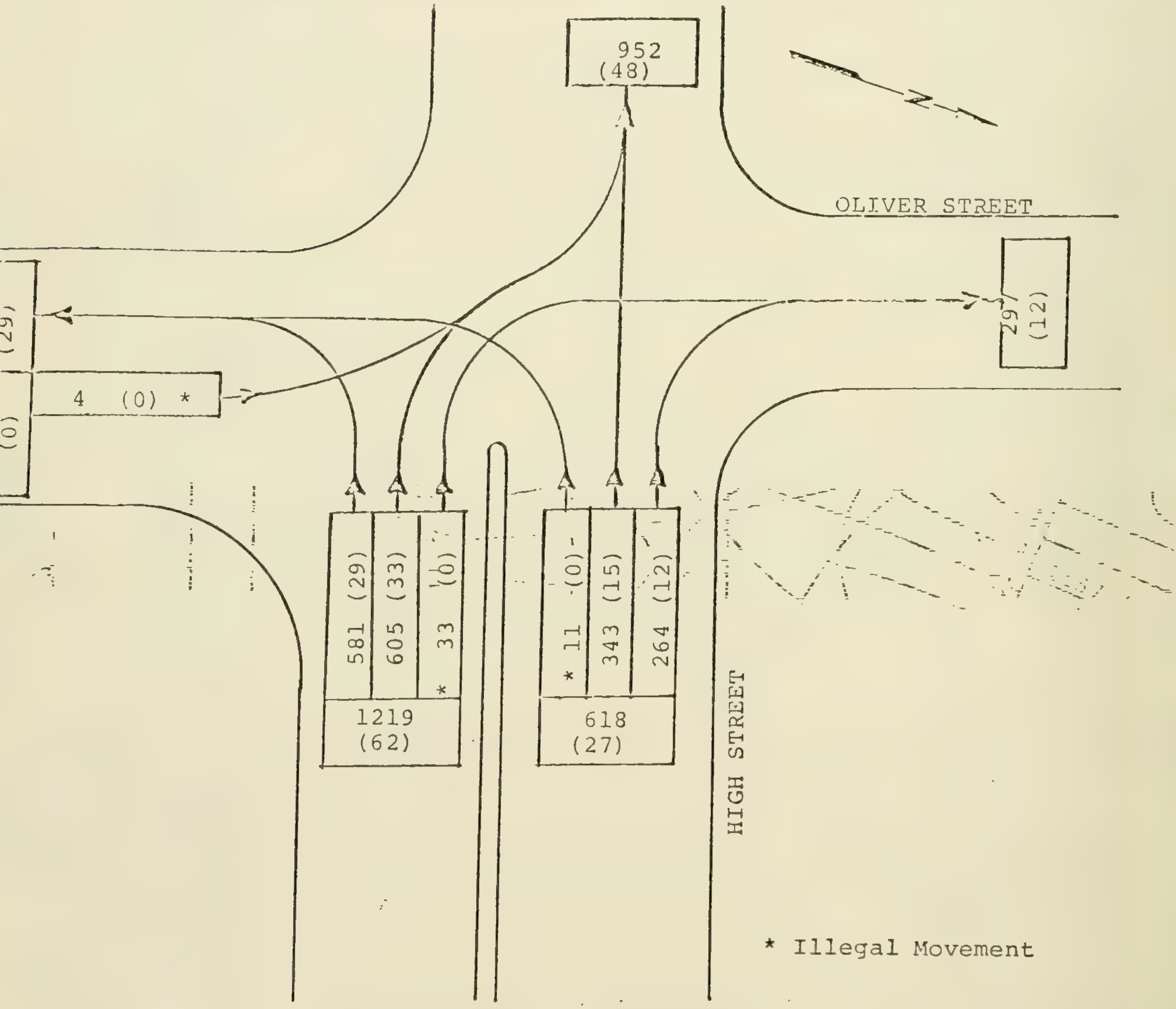
vhd Vanasse/Hangen Design, Inc.
Boston, Massachusetts

V.I ..30-101

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/12/80 DAY of WEEK Wed.

INTERSECTION High St. & Oliver St.



* Illegal Movement

STREET		DIRECTIONAL DISTRIBUTION	PERCENT of A.D.T.
Ramp	WB	1219 (62)	66.2
High St.	WB	618 (27)	33.6
Oliver St.	NB	4 (0)	.2
TOTAL		1841 (89)	100.0

TIME of COUNT	
AM PEAK HOUR	
8:00A-9:00A	
VEHICLES COUNTED	
ALL VEHICLES	XXX
TRUCKS	(XX)
PERCENT TRUCKS	4.8 %

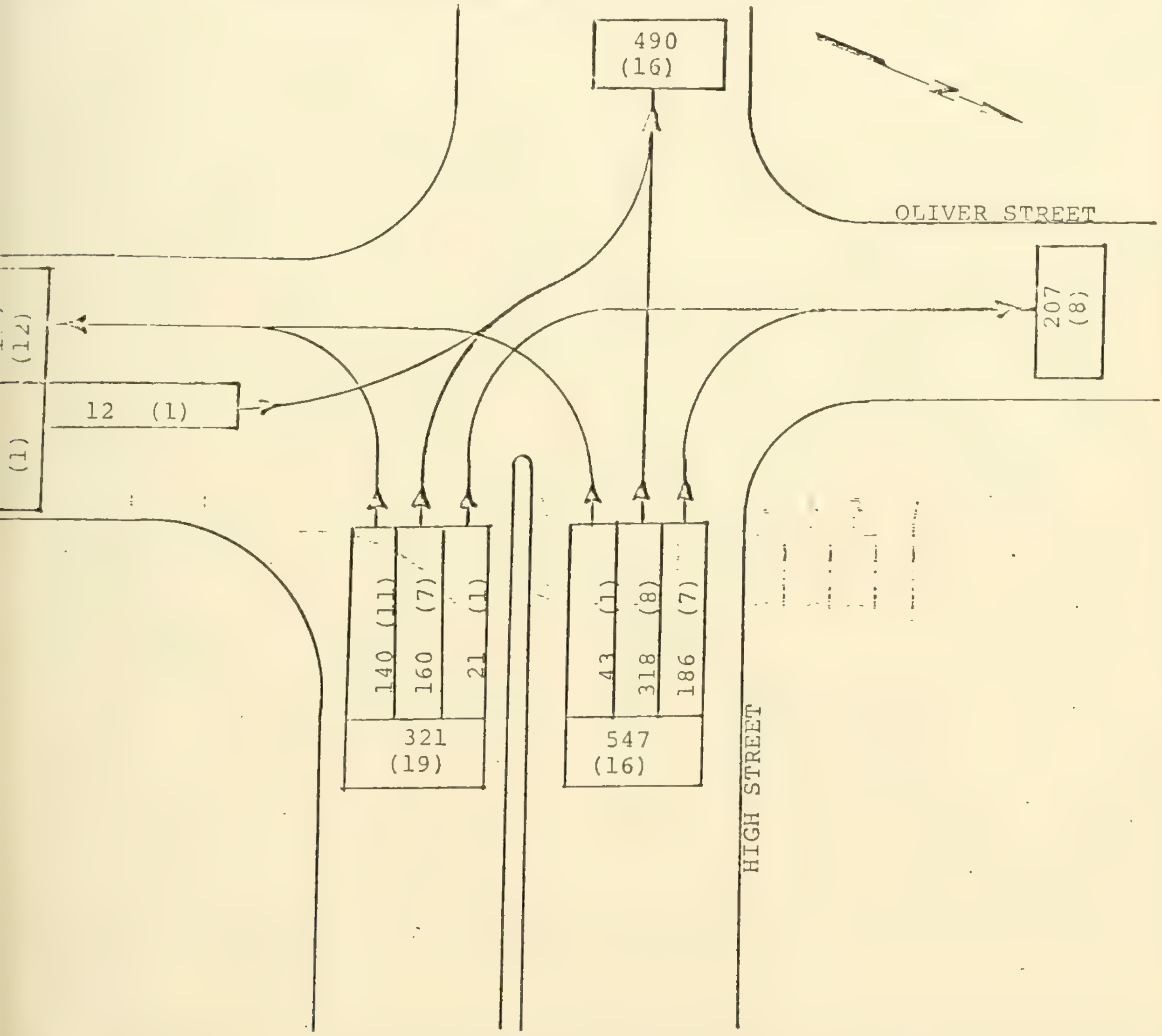
vhd Vanasse/Hangen Design, Inc.
Boston, Massachusetts

VH #80-101

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 11/12/80 DAY of WEEK Wed.

INTERSECTION High St. & Oliver St.



STREET		DIRECTIONAL DISTRIBUTION	PERCENT of A.D.T.	TIME of COUNT
Ramp	WB	321 (19)	36.5	
High St.	WB	547 (16)	62.2	PM PEAK HOUR
Oliver St.	NB	12 (1)	1.3	4:30-5:30 PM
				VEHICLES COUNTED
				ALL VEHICLES XXX
				TRUCKS (XX)
TOTAL		1201 (36)	100.0	PERCENT TRUCKS 4.1 %

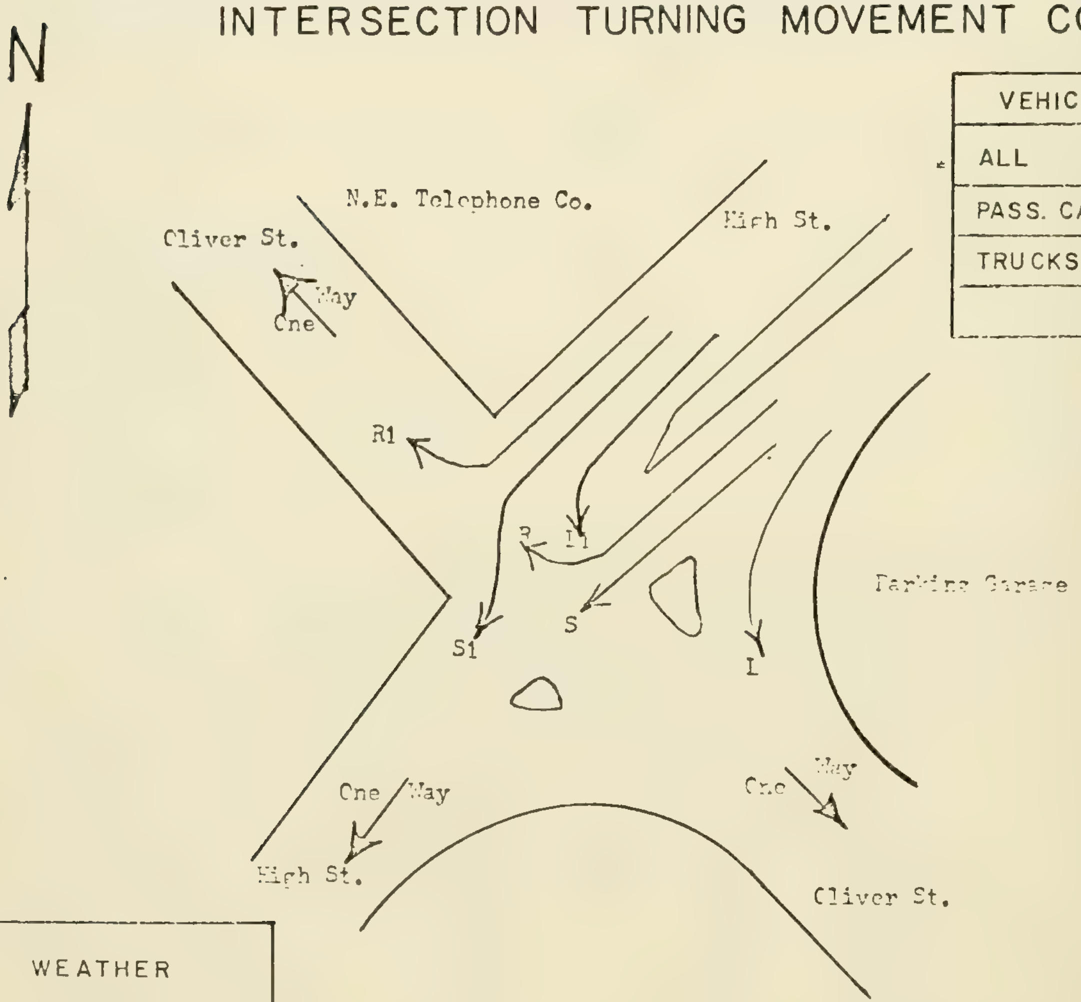
Traffic Control Systems
Planning, Engineering, Construction & Maintenance
Brighton, Ma. Tel. (617) 782-9757

INT. NO. 376

CITY	Boston Proper
INTERSECTION	High Street Off Ramp, & Oliver Street
DATE 3/19/81	DAY OF WEEK Thursd

INTERSECTION TURNING MOVEMENT COUNT #566

VEHICLES COUNTED	
ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER

Sunny

COUNT TAKEN BY

D.S., & G.W.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
7am-6pm	11 Hours

STREET		ENTERING VOLUME	FLOW PERCENT
Artery Off Ramp	SB	8408	63.5
High Street	SB	4838	36.5
TOTAL		13246	100%

COMMENTS

Traffic Control Systems
Planning, Engineering, Construction, & Maintenance
Brighton, Ma. Tel. (617) 782-9757

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION High Street, Off Ramp, & Oliver Street CITY OR TOWN Boston Proper

DATE 3/19/81 DAY OF WEEK Thursday WEATHER Sunny RECORDER D.P. & G.

TIME STARTS __ M	Artery Off Ramp Southbound			High Street Southbound			TOTAL HALF HOUR TALLY
	L	S	R	L1	S1	R1	
7:00-7:30	374	226	16	4	114	72	806
7:30-8:00	400	263	6	7	149	93	918
8:00-8:30	384	350	4	6	180	141	107
8:30-9:00	248	271	19	11	168	113	83
9:00-9:30	229	257	22	3	149	120	78
9:30-10:00	185	203	11	12	131	92	63
10:00-10:30	207	172	28	8	95	83	59
10:30-11:00	170	159	15	12	102	77	53
11:00-11:30	178	181	30	11	116	74	59
11:30-12:00	182	208	21	18	118	98	64
12:00-12:30	180	174	21	13	98	95	58
12:30-1:00	167	169	27	17	89	74	54
1:00-1:30	163	125	15	19	95	69	48
1:30-2:00	196	134	20	19	125	68	56
2:00-2:30	173	133	18	21	94	56	495
2:30-3:00	159	127	17	17	119	64	50
3:00-3:30	130	139	28	24	96	54	47
3:30-4:00	90	83	10	13	100	71	36
4:00-4:30	94	84	10	26	119	71	40
4:30-5:00	107	104	18	18	158	90	49
5:00-5:30	126	111	16	21	129	95	49
5:30-6:00	107	75	29	19	102	103	43
6:00-6:30							
6:30-7:00							
7:00-7:30							
7:30-8:00							
8:00-8:30							
8:30-9:00							
9:00-9:30							
9:30-10:00							
10:00-10:30							
10:30-11:00							
TOTAL	4259	3748	401	319	2646	1873	GRAND TOTAL
TOTAL OF L S R	8408			4838			1324

LANNING ENGINEERING & DEVELOPMENT

NT. NO. * 9/22&23/76

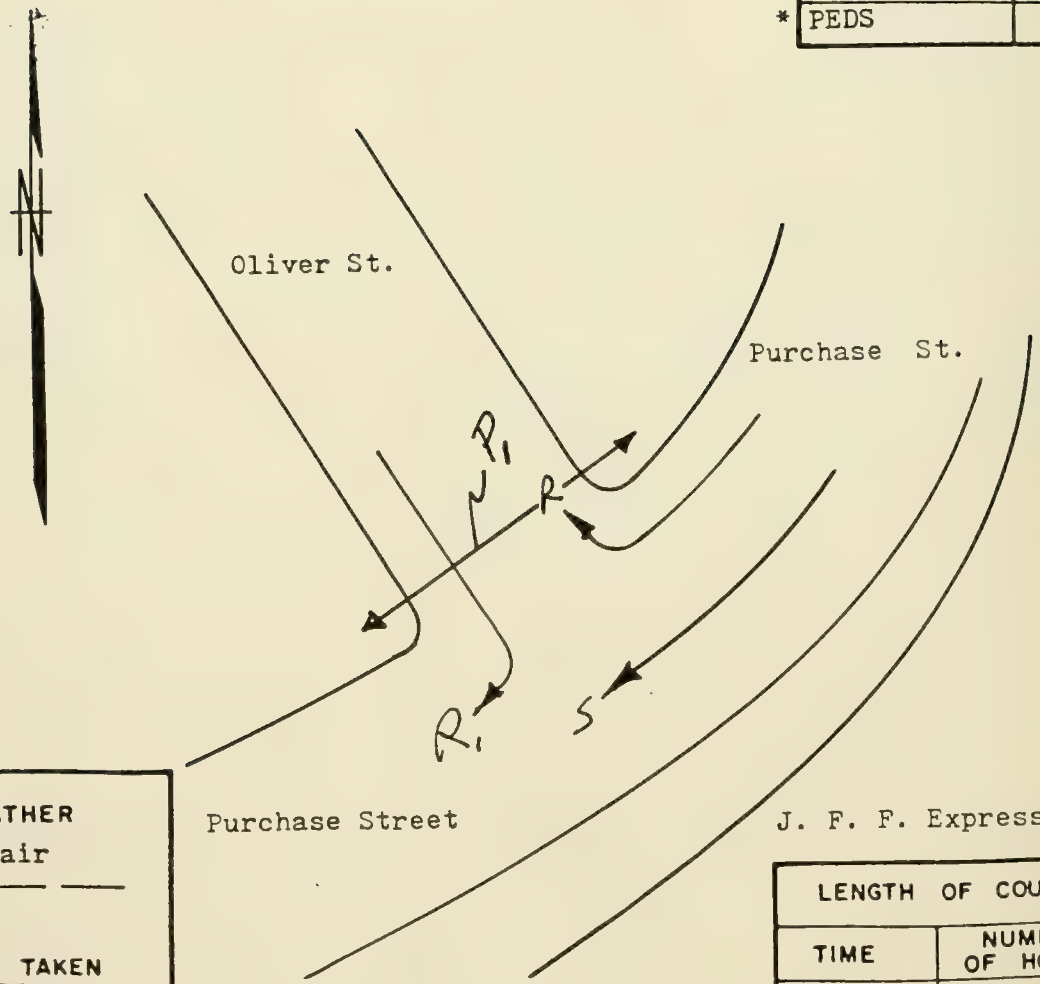
CITY Boston Proper

INTERSECTION Oliver Street & Purchase Street

DATE * DAY OF WEEK Wed-THur

INTERSECTION TURNING MOVEMENT COUNT #2022 558

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)
* PEDS	



WEATHER
Fair

COUNT TAKEN BY
J.M.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 hours

STREET		ENTERING VOLUME	FLOW PERCENT
Purchase St.	WB	4531	59
Oliver St.	SB	3178	41
TOTAL		7709	100%

COMMENTS

PLANNING ENGINEERING & DEVELOPMENT

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION Oliver St. & Purchase St. CITY OR TOWN Boston Proper

DATE 9/22&23/76 DAY OF WEEK Wed-Thur WEATHER Fair RECORDER J.M.

558

TIME STARTS __M	Purchase St. Westbound			Oliver St. Southbound									TOTAL HALF HOURLY TALLY
	S		R		R,			R,					
7:00-7:30	99		3		229			2					331
7:30-8:00	194		13		270			15					477
8:00-8:30	276		23		311			26					610
8:30-9:00	294		23		260			35					577
9:00-9:30	165		27		152			27					344
9:30-10:00	156		16		140			15					312
10:00-10:30	148		13		133			13					294
10:30-11:00	126		23		136			7					285
11:00-11:30	132		20		143			9					295
11:30-12:00	150		22		144			16					316
12:00-12:30	176		9		133			20					318
12:30-1:00	195		12		147			21					354
1:00-1:30	188		6		136			32					330
1:30-2:00	195		10		112			26					317
2:00-2:30	238		19		154			22					411
2:30-3:00	188		12		125			22					325
3:00-3:30	205		12		99			7					316
3:30-4:00	196		6		73			17					276
4:00-4:30	240		8		88			26					336
4:30-5:00	252		11		77			32					340
5:00-5:30	269		8		70			53					347
5:30-6:00	146		4		46			18					196
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	4228		303		3178			460					GRAND TOTAL
TOTAL OF L.S & R	4531			3178									7709

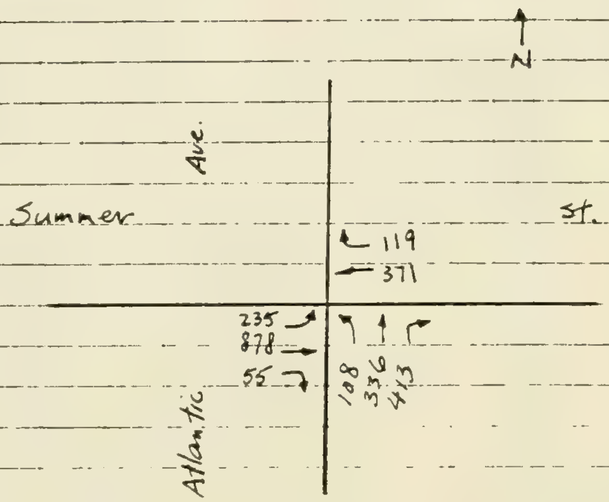
VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

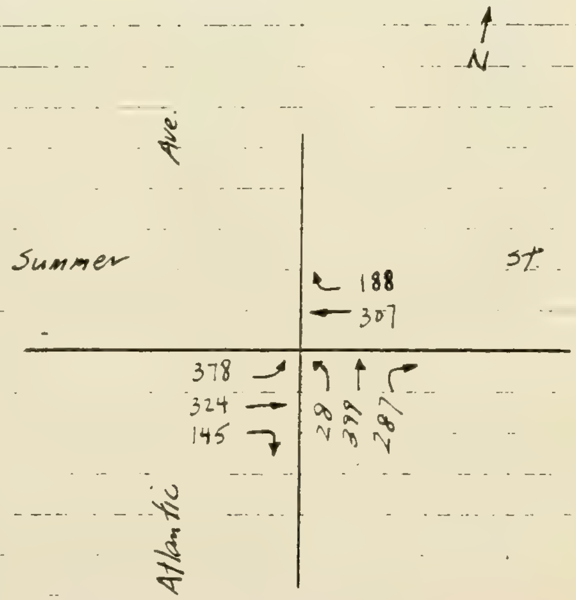
JOB: International Place JOB No. 0923
LOCATION: SHEET OF
CALCULATED BY: BG DATE
CHECKED BY: DATE
TITLE: Turning Movement Counts

AM

Source: Dewey Sq. TSM Study



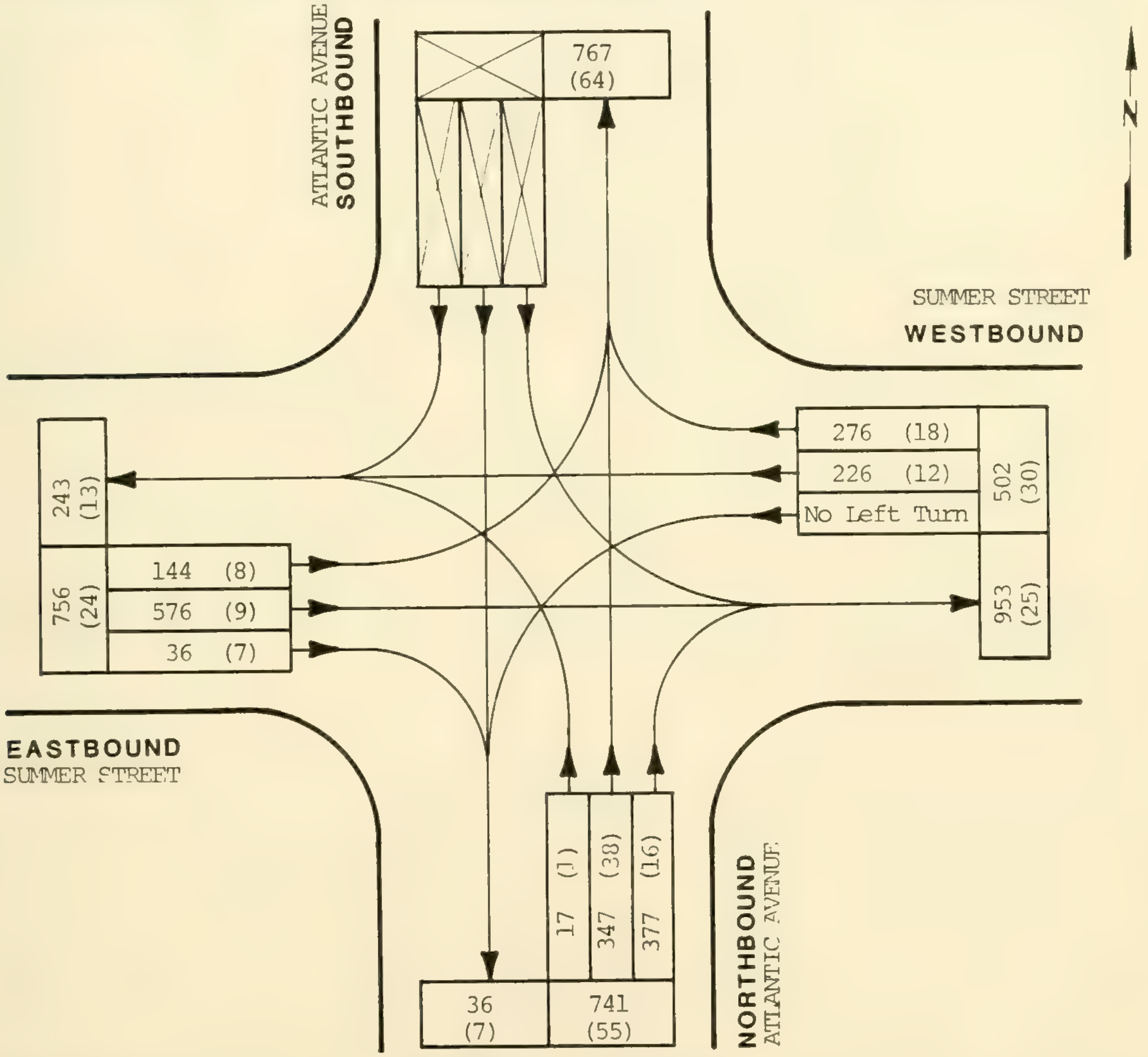
PM



VH
Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 12/4/81 DAY of WEEK Friday
INTERSECTION Atlantic Avenue @ Summer Street JOB No. 0121-10



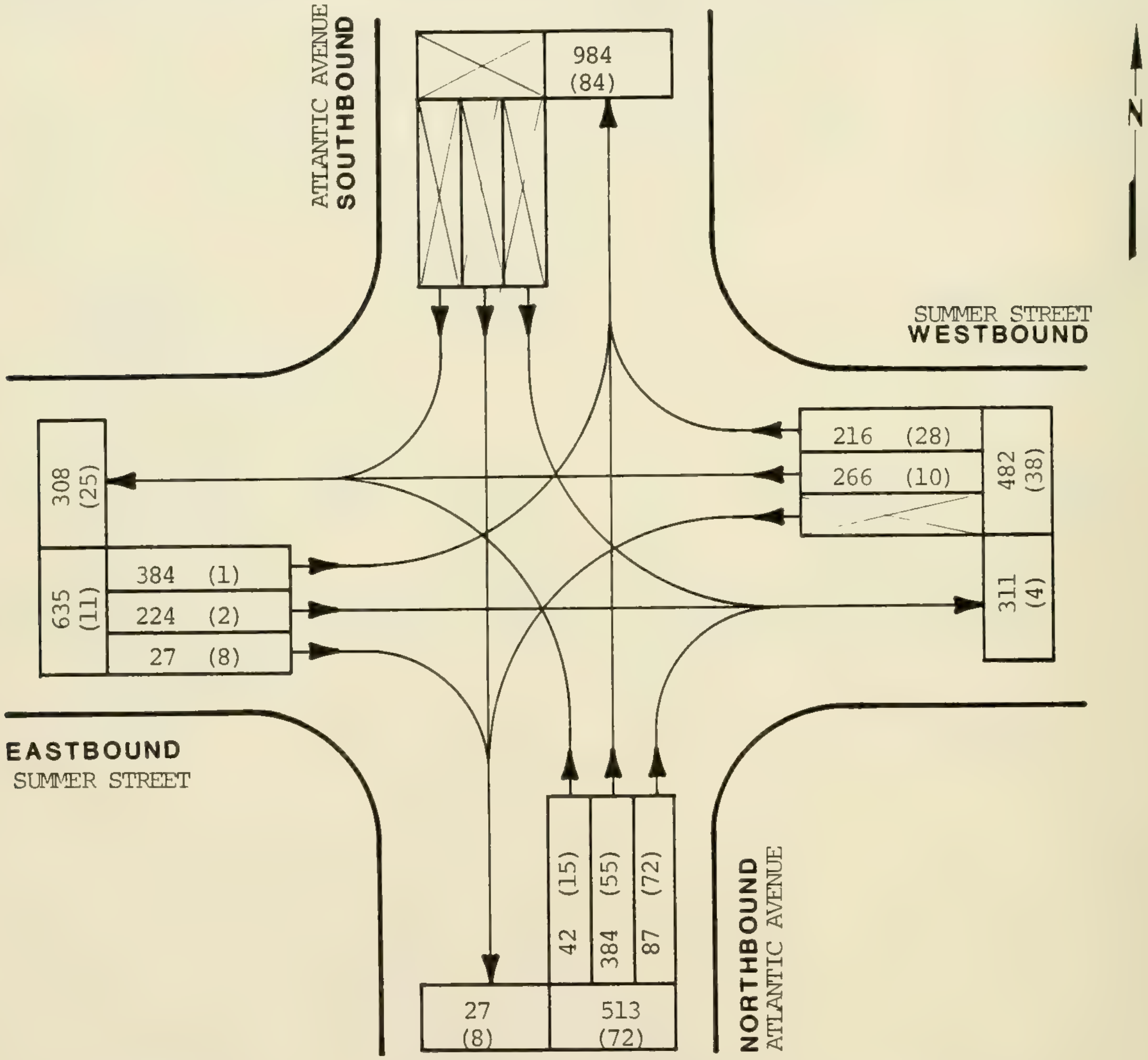
STREET		ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
ATLANTIC AVENUE	N.B.	741 (55)	37%	7:15AM - 8:15AM
SUMMER STREET	E.B.	756 (24)	38%	
SUMMER STREET	W.B.	502 (30)	25%	
				AM Peak Hour
				VEHICLES COUNTED
				ALL VEHICLES XXX
				TRUCKS (XX)
TOTAL		1999 (109)	100%	PERCENT TRUCKS 5.4 %

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 11/20/81 DAY of WEEK Friday

INTERSECTION Atlantic Avenue @ Summer Street JOB No. 0121-10



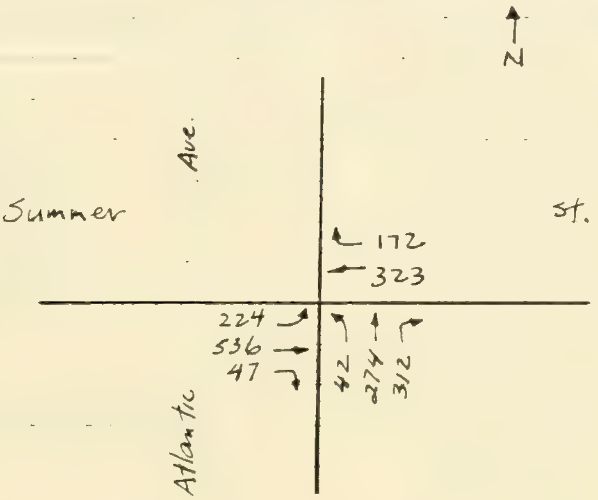
STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
SUMMER STREET W.B.	482 (38)	30%	4:45PM - 5:45PM
SUMMER STREET E.B.	635 (11)	39%	
ATLANTIC AVENUE N.B.	513 (72)	31%	PM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX
			TRUCKS (XX)
TOTAL	1630 (121)	100%	PERCENT TRUCKS 7.4 %

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

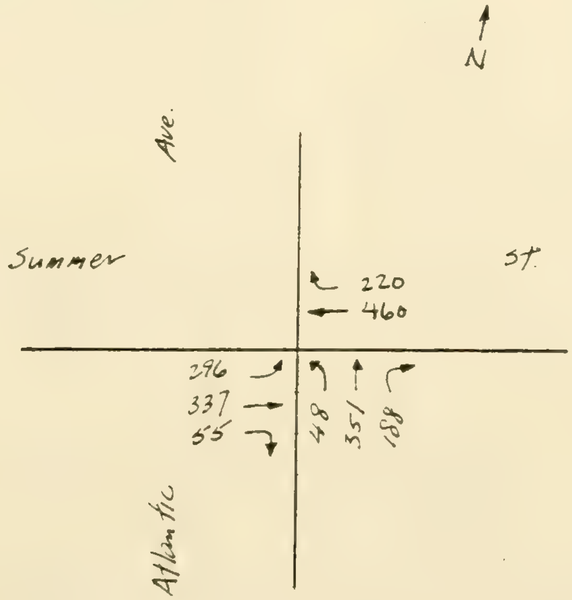
JOB: International Place   JOB No. 0923
LOCATION: SHEET ___ OF ___
CALCULATED BY: BG   DATE
CHECKED BY: DATE
TITLE: Turning Movement Counts

AM

Source: Third Harbor EIR



PM



Planning, Engineering, Construction & Maintenance
Brighton, Ma. Tel. (617) 782-9757

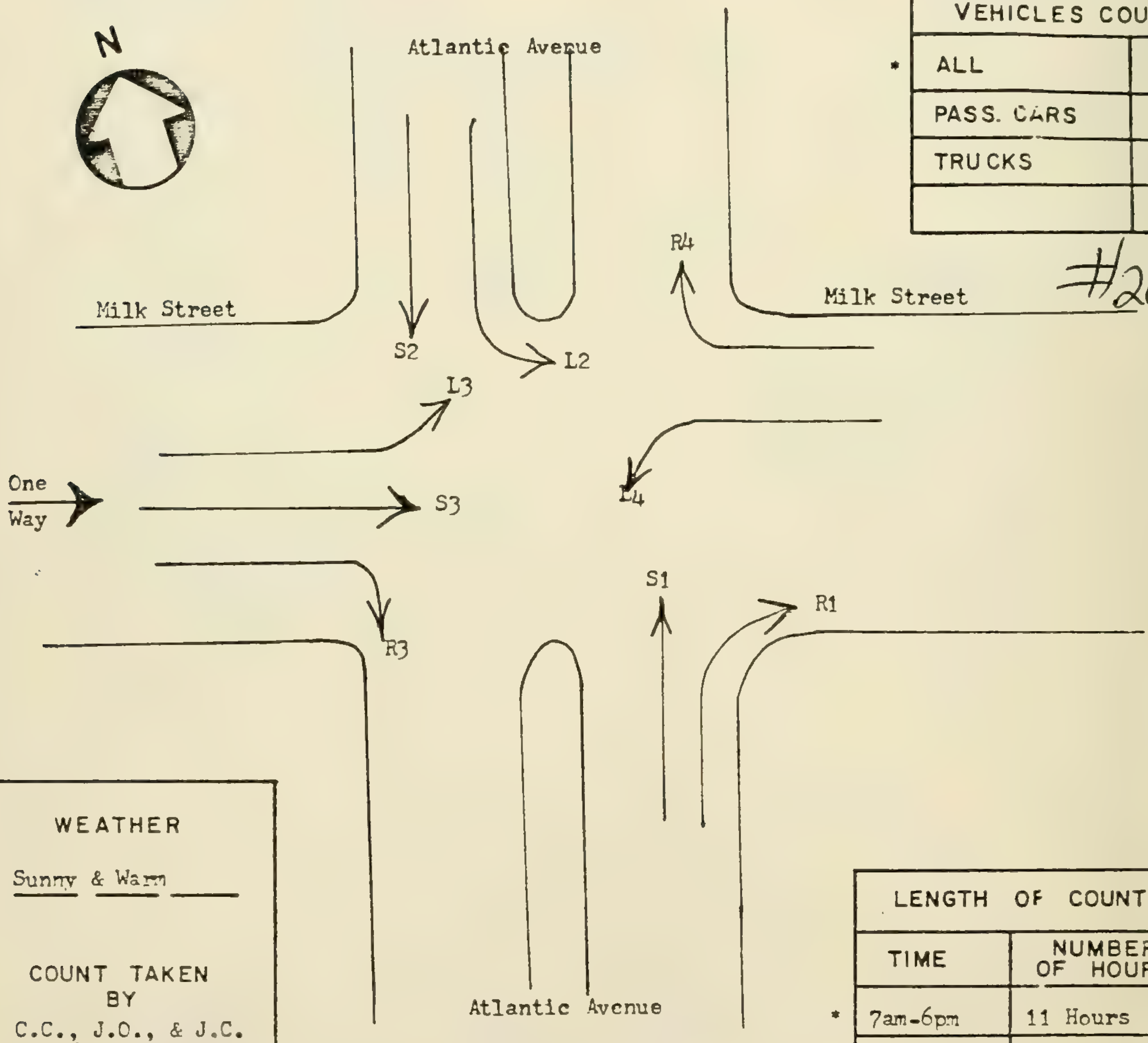
INT. NO. 242

CITY	Boston Proper
INTERSECTION	Atlantic Ave. & Milk Street
DATE 7/10/80	DAY OF WEEK Thursd

INTERSECTION TURNING MOVEMENT COUNT #2

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)

#2006



WEATHER

Sunny & Warm

COUNT TAKEN BY

C.C., J.O., & J.C.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 Hours

To Congress St.

STREET		ENTERING VOLUME	FLOW PERCENT
Atlantic Avenue	NB	7015	55.5
Atlantic Avenue	SB	3320	25.5
Milk Street	EB	2119	14.6
Milk Street	WB	1219	8.6
TOTAL		14284	100 %

COMMENTS

...ng, Engineering, Construction, & Maintenance
...nton, Ma. Tel. (617) 782-9757

...AFFIC MOVEMENT SUMMARY TABLE

...ON Atlantic Avenue & Milk Street CITY OR TOWN Boston Proper

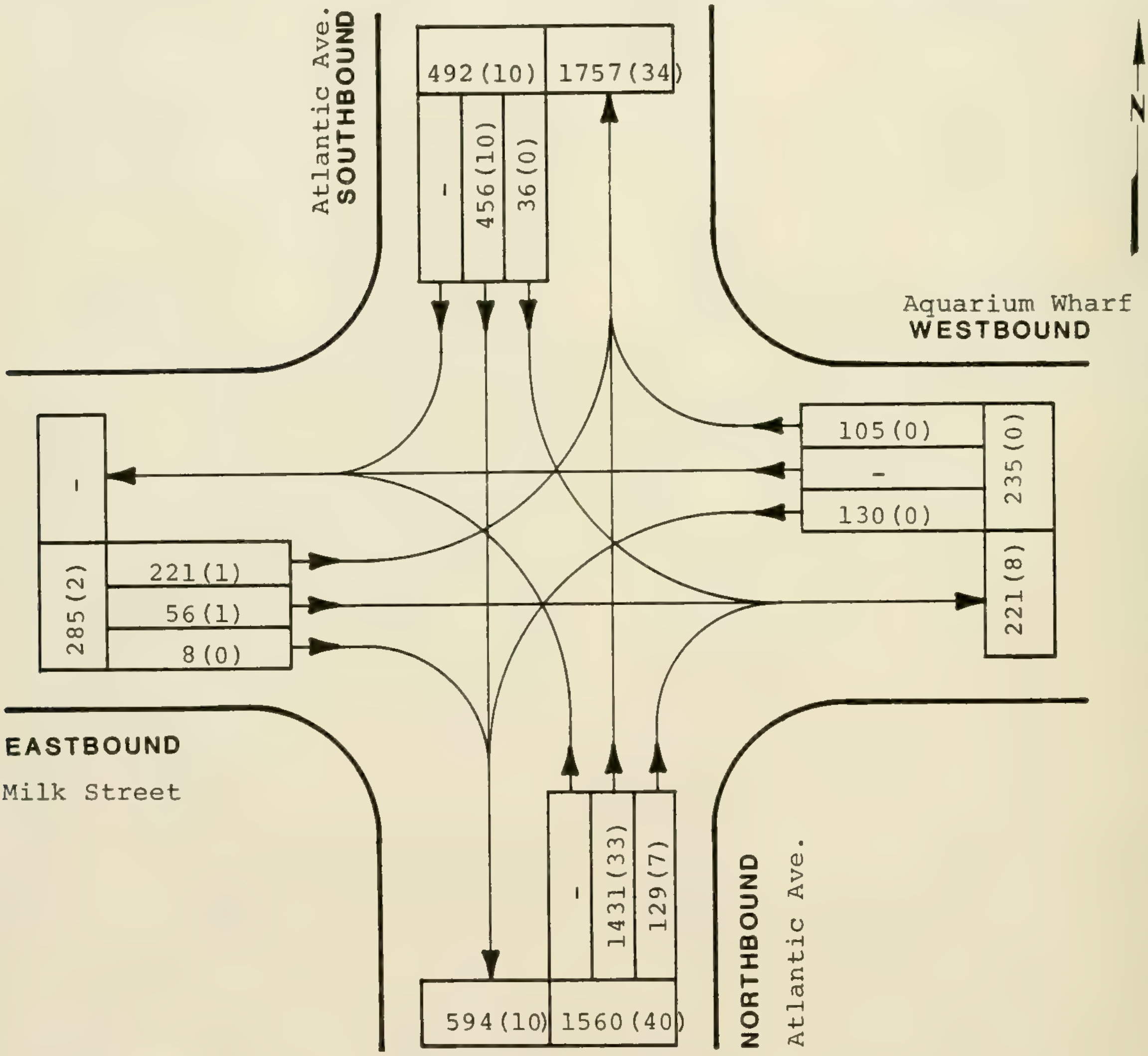
...E 7/10/80 DAY OF WEEK Thursday WEATHER Sunny & Warm RECORDER C.C., J.C & J.C.

TIME STARTS __M	Atlantic Avenue Northbound			Atlantic Avenue Southbound			Milk Street East Bound			Milk Street Westbound			TOTA... HALF H... TAL...
		S1	R1	L2	S2		L3	S3	R3	L4		R4	
7:00-7:30		175	20	6	158		13	23	1	7		3	406
7:30-8:00		206	33	8	219		14	37	4	5		6	53[illegible]
8:00-8:30		191	66	19	199		28	56	0	16		12	58[illegible]
8:30-9:00		249	80	20	159		20	68	2	5		11	61[illegible]
9:00-9:30		228	69	15	104		15	79	0	8		9	52[illegible]
9:30-10:00		205	58	13	119		19	59	1	16		17	50[illegible]
10:00-10:30		192	57	5	82		21	34	1	7		8	40[illegible]
10:30-11:00		227	59	11	136		25	54	2	13		9	53[illegible]
11:00-11:30		237	68	13	122		40	68	1	12		12	57[illegible]
11:30-12:00		276	71	21	118		41	65	3	19		27	64[illegible]
12:00-12:30		224	82	24	130		55	55	4	20		38	63[illegible]
12:30-1:00		223	50	20	87		29	46	1	29		29	51[illegible]
1:00-1:30		229	71	13	134		30	50	4	48		45	62[illegible]
1:30-2:00		210	60	15	124		32	41	2	41		22	54[illegible]
2:00-2:30		161	33	11	99		26	21	6	35		26	41[illegible]
2:30-3:00		232	58	14	142		34	37	3	40		16	57[illegible]
3:00-3:30		308	69	9	193		47	26	4	46		30	73[illegible]
3:30-4:00		461	35	3	185		104	20	3	52		48	91[illegible]
4:00-4:30		526	32	4	141		119	12	3	55		43	93[illegible]
4:30-5:00		524	41	10	159		158	23	2	63		46	102[illegible]
5:00-5:30		668	27	14	129		137	29	5	88		29	112[illegible]
5:30-6:00		479	48	8	113		120	36	1	73		35	91[illegible]
6:00-6:30													
6:30-7:00													
AM 7:00-7:30		440	146	39	358		48	124	2	21		23	120[illegible]
7:30-8:00													
8:00-8:30													
PM 8:30-9:00		1192	68	24	28[illegible]		295	52	7	151		75	215[illegible]
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL		6431	1187	276	3052		1127	[illegible]	53	698		521	GRA... TOT...
TOTAL OF ...	7618			3328			[illegible]			1219			142[illegible]

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 7/26/84 DAY of WEEK Thursday
INTERSECTION Milk St./Atlantic Ave. JOB No. 0923



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Atlantic Ave. (NB)	1560 (40)	61.0%	5:00 - 6:00 PM
Atlantic Ave. (SB)	492 (10)	19.0%	
Milk St. (EB)	285 (2)	11.0%	PM Peak Hour
Aquarium Wharf (WB)	235 (0)	9.0%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 2572
			TRUCKS (XX) 52
TOTAL	2572 (52)	100.0%	PERCENT TRUCKS 2.0%

PARK SQUARE ASSOCIATES, INC
CONSULTING ENGINEERS ARCHITECTS
AND PLANNERS

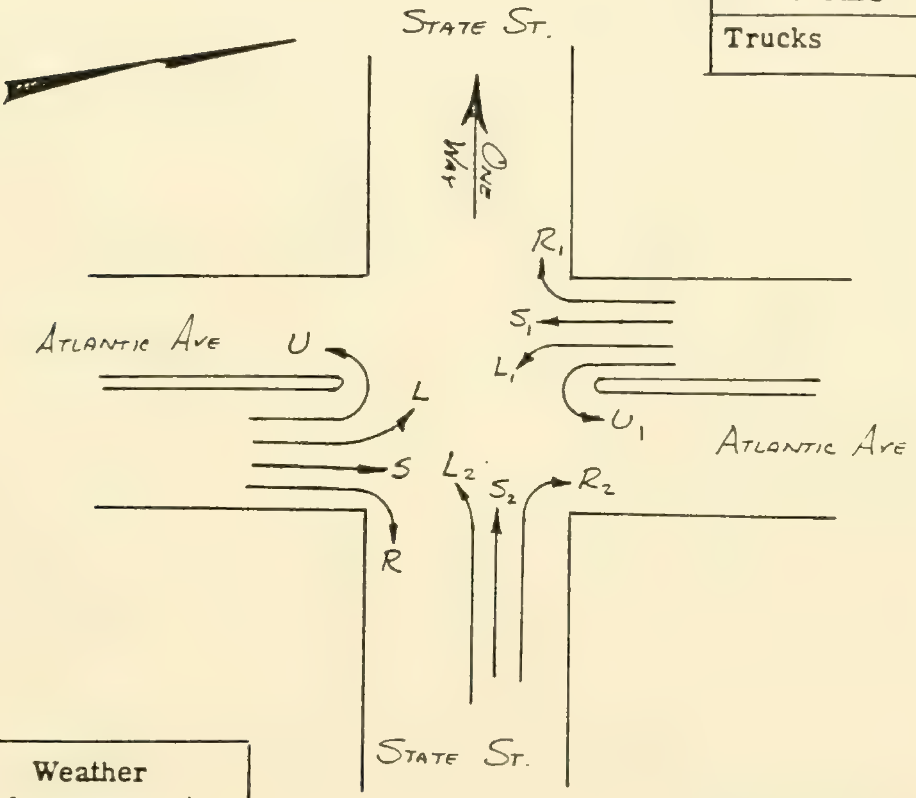
City Boston - [illegible]
Intersection Atlantic Ave & State St.

INT. NO. 54 (BTPD # 2023) Date 3/24/83 Day of Week Thursday

INTERSECTION TURNING MOVEMENT COUNT

2023

Vehicles Counted	
All	X
Pass. Cars	
Trucks	



Weather
Clear - Teen's

Count Taken By
Kevin Gabriel

Length of Count	
Time	Number of Hours
7am-6pm	11 hrs

Street	Entering Volume	Flow Percent	Comments
Atlantic Ave (NB)	10,555	58%	
Atlantic Ave (SB)	5843	32%	
State St. (WB)	1729	10%	
Total	18127	100%	

PARK SQUARE ASSOCIATES, INC.

STA. NO. 54

2023

TRAFFIC MOVEMENT SUMMARY TABLE

Location Atlantic Ave & State St. City or Town Boston - Proper

Date 3/24/83 Day of Week Thursday Weather Clr Recorder KG

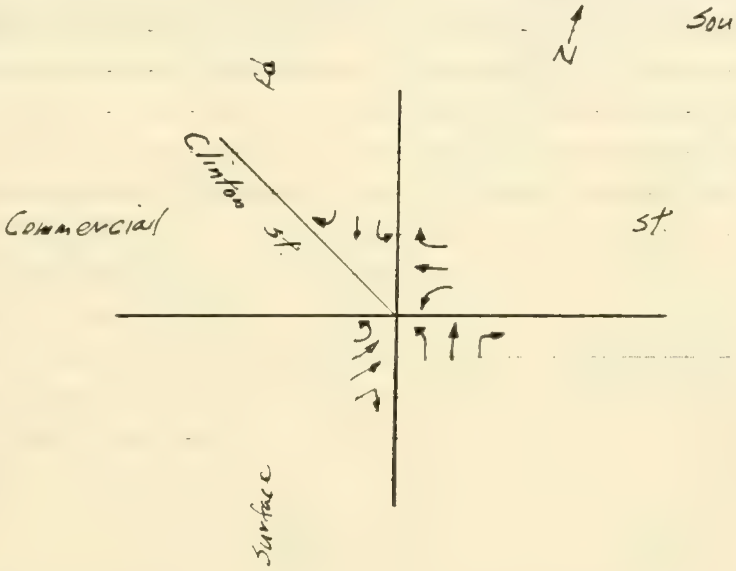
Time Starts 7:00AM	Atlantic Avenue (NB) L	S	R	U	(SB) L_1	S_1	R_1	U_1	State St. (WB) L_2	S_2	R_2		Total Half Hour Tally
7:00-7:30	53	192	33	1	26	169	31	0	6	21	17		549
7:30-8:00	74	263	36	3	31	291	52	1	12	42	38		843
8:00-8:30	99	327	52	6	41	417	63	3	19	36	57		1120
8:30-9:00	93	285	43	2	46	374	74	0	12	24	52		1005
9:00-9:30	84	264	47	3	39	149	66	2	11	54	47		766
9:30-10:00	77	246	31	2	22	138	56	0	11	43	34		660
10:00-10:30	69	213	25	3	16	127	45	1	8	37	24		568
10:30-11:00	68	209	28	2	20	119	54	1	13	40	23		577
11:00-11:30	70	206	26	1	19	116	49	1	11	39	24		562
11:30-12:00	65	282	42	1	21	138	50	0	19	42	20		680
12:00-12:30	68	280	46	1	22	147	59	1	21	43	22		710
12:30-1:00	73	257	37	2	16	143	59	1	3	39	20		650
1:00-1:30	75	231	25	2	21	119	58	0	4	42	22		599
1:30-2:00	77	241	33	2	25	123	64	2	6	47	26		646
2:00-2:30	65	254	23	0	14	113	43	4	5	53	17		591
2:30-3:00	79	271	34	1	27	121	57	0	4	67	24		685
3:00-3:30	73	550	18	2	16	175	50	3	8	39	18		952
3:30-4:00	85	670	19	1	10	200	61	1	5	32	13		1097
4:00-4:30	97	730	18	1	12	241	69	2	8	36	18		1232
4:30-5:00	103	766	21	3	16	269	84	1	14	43	24		1344
5:00-5:30	92	751	36	0	23	185	62	0	7	50	36		1242
5:30-6:00	96	585	34	1	28	176	52	0	4	52	21		1049
6:00-6:30													
6:30-7:00													
AM	192	612	95	8	87	791	137	3	31	60	139		2125
7:30-8:00													
PM	195	1517	57	3	39	454	146	1	21	93	60		2536
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	1735	8073	707	40	511	4050	1258	24	211	921	597		GRAND TOTAL
Total of L S & R	10555				5843				1729				18127

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

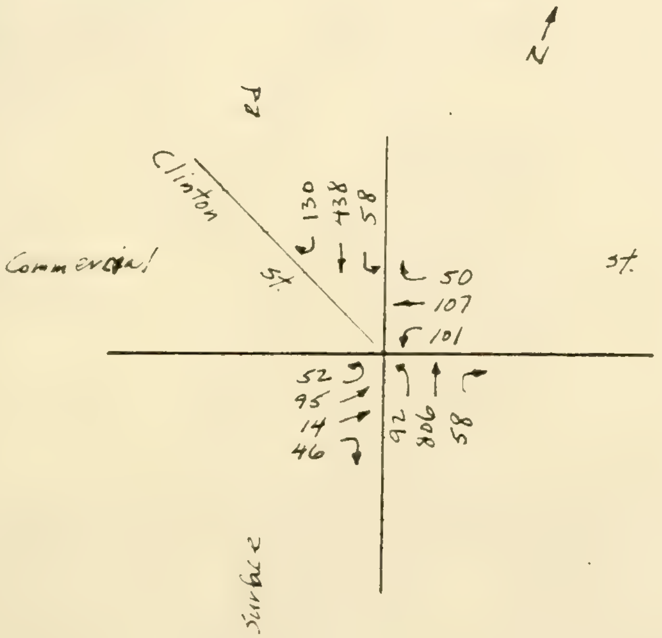
JOB International Place JOB No. 0923
LOCATION ______ SHEET ____ OF ____
CALCULATED BY: BG DATE ______
CHECKED BY: ______ DATE ______
TITLE Turning Movement Counts

AM

Source: Marketplace Center EIR dated April, 83.



PM

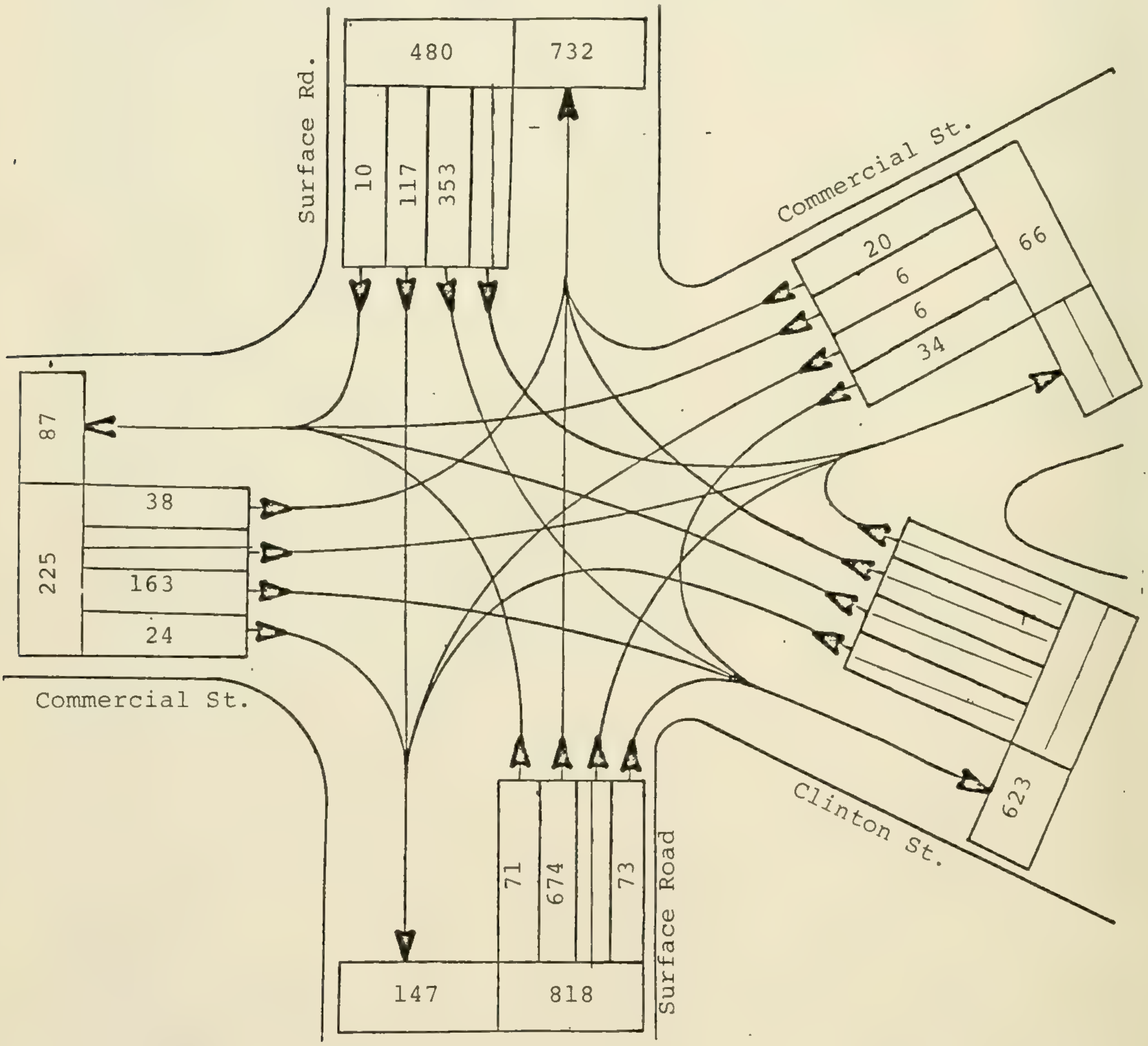


Vanasse / Hangen Ass... ...tes, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 7-26-84 DAY of WEEK Thursday

INTERSECTION Clinton St./Surface Rd. JOB No. 0923



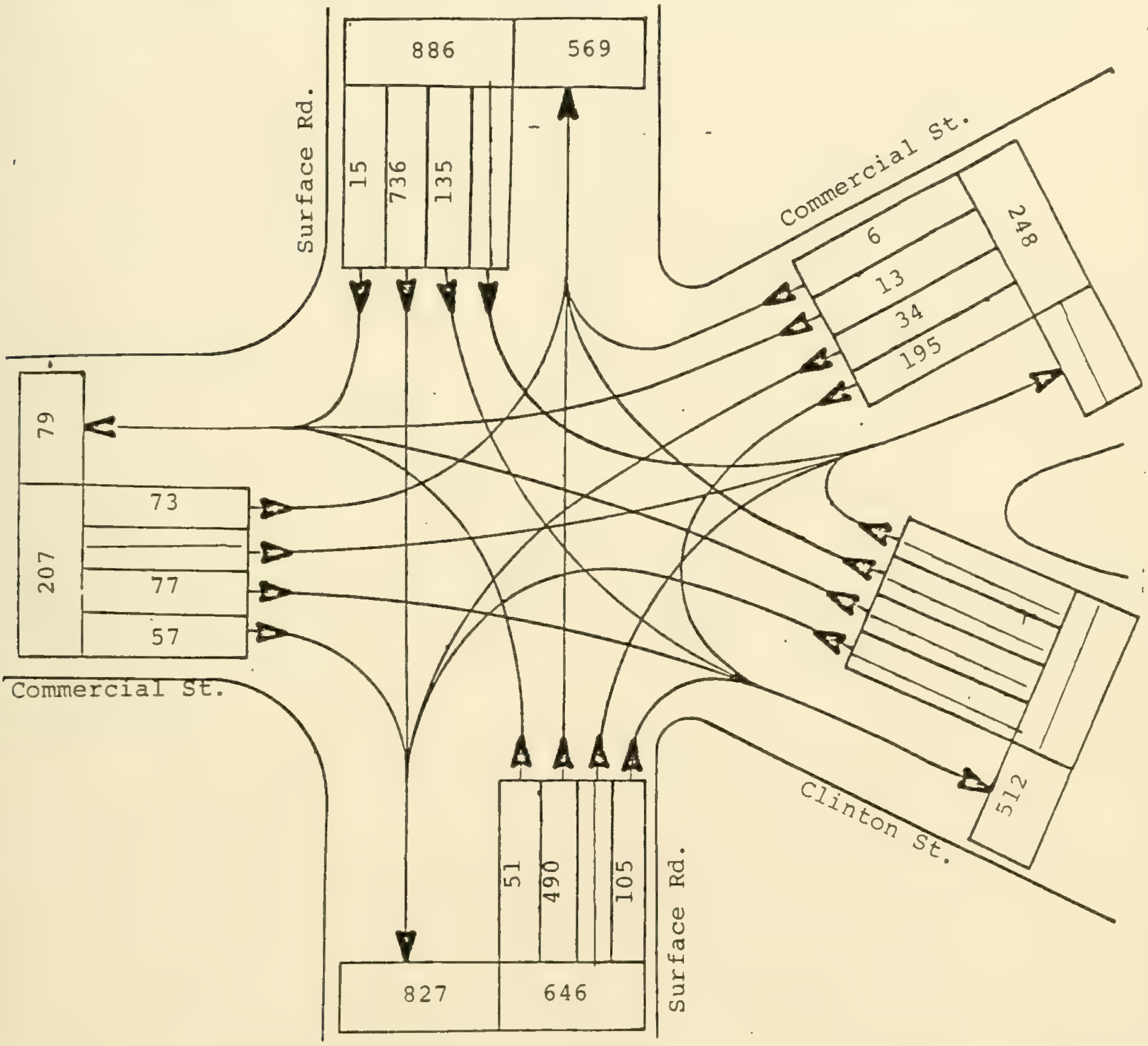
STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Surface Rd. (NB)	480	30.2%	8:00 - 9:00 AM
Surface Rd. (SB)	818	51.5%	
Commercial St. (EB)	66	4.1%	
Commercial St. (NB)	225	14.2%	AM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 1589
			TRUCKS (XX) --
TOTAL	1589	100.0%	PERCENT TRUCKS -- %

Vanasse / Hangen ...
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY BOSTON, MA DATE 7-26-84 DAY of WEEK Thursday

INTERSECTION Clinton St./Surface Rd. JOB No. 0923



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Surface Rd. (NB)	886	44.6%	4:15 - 5:15 PM
Surface Rd. (SB)	646	32.5%	
Commercial St. (EB)	248	12.5%	PM Peak Hour
Commercial St. (WB)	207	10.4%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 1987
			TRUCKS (XX) --
TOTAL	1987	100.0%	PERCENT TRUCKS -- %

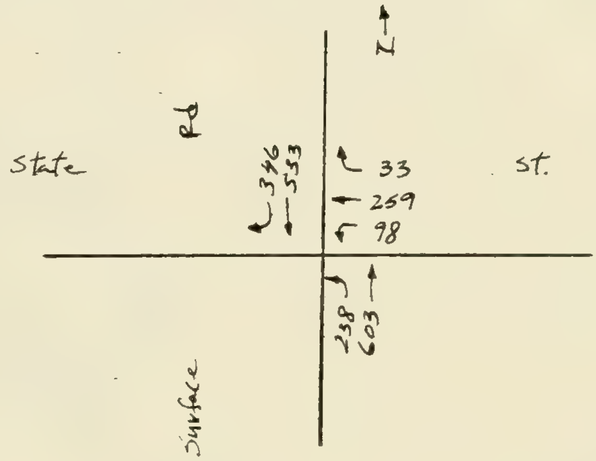
VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

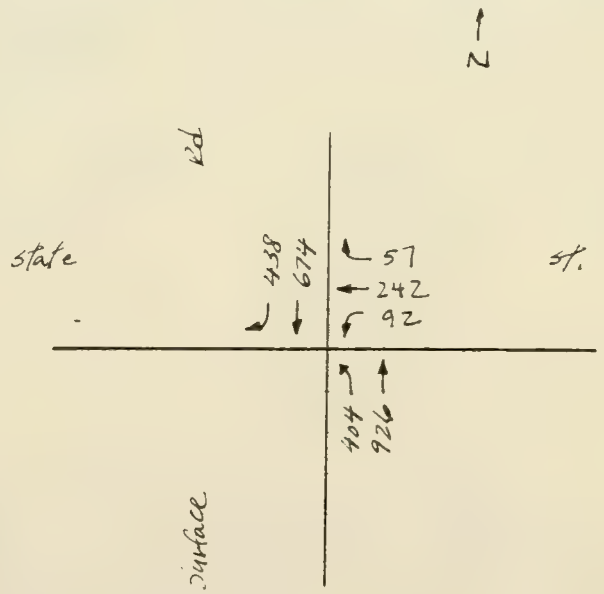
JOB: International Place JOB No. 0923
LOCATION: ______ SHEET ____ OF ____
CALCULATED BY: BG DATE ______
CHECKED BY: ______ DATE ______
TITLE: Turning Movement Counts

AM

Source: Third Harbor EIR
dated Dec. 82



PM



VH

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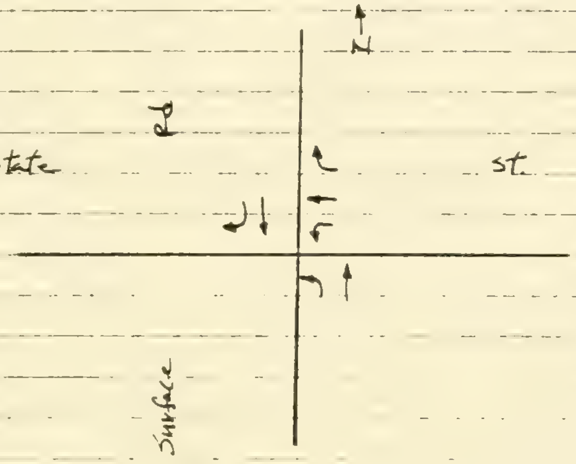
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

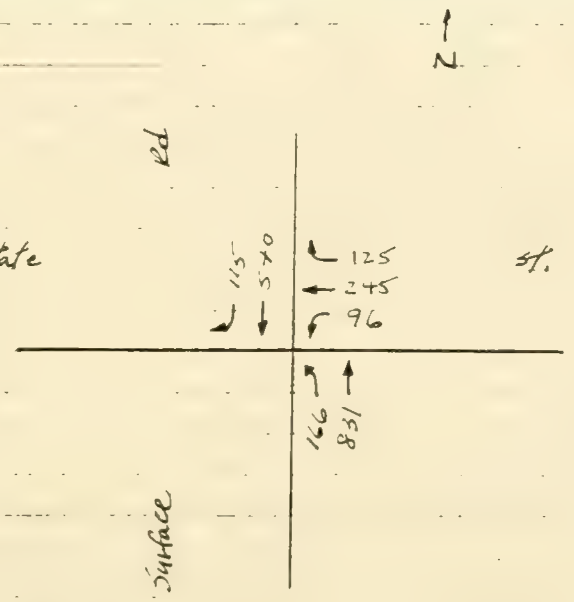
JOB International Place JOB No. 0923
LOCATION ______ SHEET ____ OF ____
CALCULATED BY: BG DATE ______
CHECKED BY: ______ DATE: ______
TITLE Turning Movement Counts

AM

Source: Marketplace Center
EIR dated April, 83.



PM



... SQUARE ASSOCIATES, INC
CONSULTING ENGINEERS, ARCHITECTS
AND PLANNERS

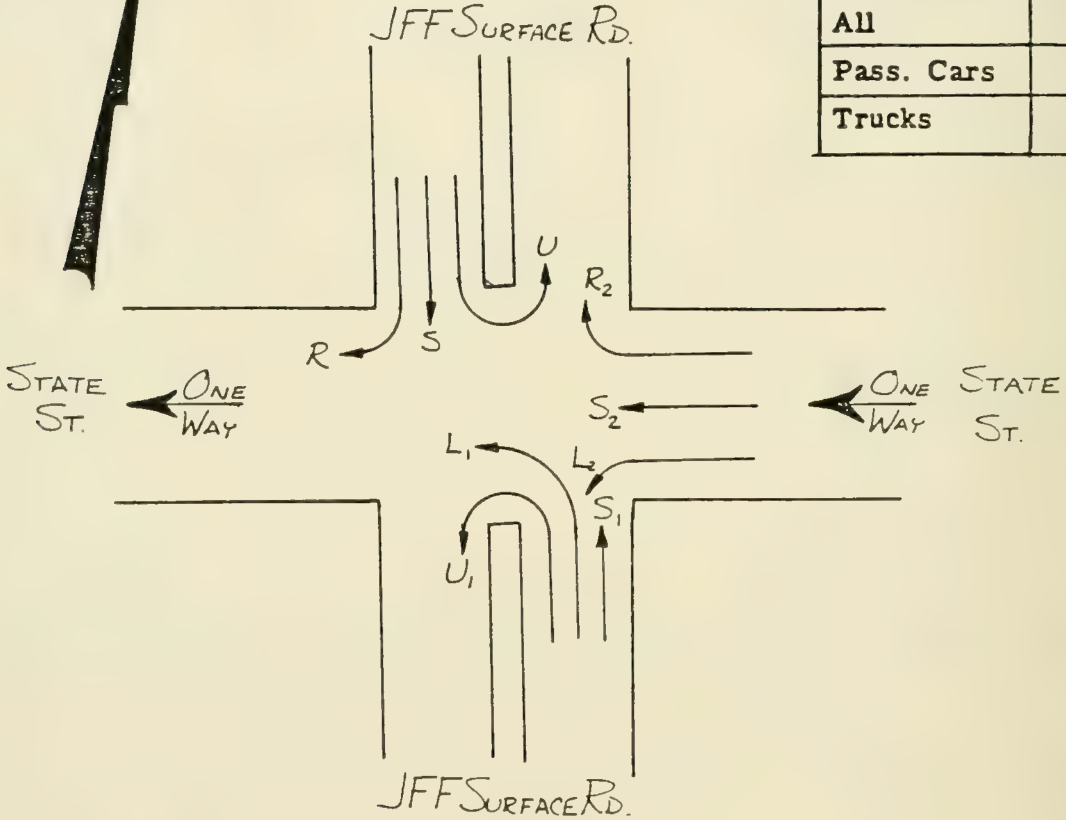
City Boston - Proper
Intersection JFF Surface Rd & State S

INT. NO. 55 (BTPD#2024) Date 6/27/83 Day of Week Monday

INTERSECTION TURNING MOVEMENT COUNT

2024

Vehicles Counted	
All	X
Pass. Cars	
Trucks	



Weather
Clear & Dry

Count Taken By
CD Schubert

Length of Count	
Time	Number of Hours
7am-6pm	11 hrs.

Street	Entering Volume	Flow Percent	Comments
JFF Surface Rd (SB)	8704	46%	
JFF Surface Rd (NB)	7148	38%	
State St. (WB)	3194	17%	
Total	19,046	100%	

K SQUARE ASSOCIATES, INC.

STA. NO. 55

2024

TRAFFIC MOVEMENT SUMMARY TABLE

Location JFF Surface Rd & State St. City or Town Boston - Proper

Date 6/27/83 Day of Week Monday Weather Clr Recorder CDS

Time Starts 7:00 AM	JFF Surface Rd (SB) S	JFF Surface Rd (SB) R	JFF Surface Rd (SB) U	JFF Surface Rd (NB) L_1	JFF Surface Rd (NB) S_1	JFF Surface Rd (NB) U_1	State St. WB L_2	State St. WB S_2	State St. WB R_2				Total Half Hour Tally
7:00-7:30	279	81	0	110	91	1	20	61	12				655
7:30-8:00	268	116	1	134	143	0	35	57	28				782
8:00-8:30	295	130	2	133	142	4	53	89	41				889
8:30-9:00	189	169	0	152	164	1	37	82	35				829
9:00-9:30	204	155	0	140	136	0	32	92	23				782
9:30-10:00	297	174	1	129	134	1	31	81	20				868
10:00-10:30	216	167	5	155	117	2	38	88	16				804
10:30-11:00	170	80	1	98	92	0	21	52	13				527
11:00-11:30	231	134	1	96	161	2	30	82	16				753
11:30-12:00	283	133	0	120	163	3	37	103	23				865
12:00-12:30	224	82	3	128	182	0	36	67	35				757
12:30-1:00	204	85	4	127	176	0	32	94	27				749
1:00-1:30	198	87	1	136	194	0	28	100	22				766
1:30-2:00	262	90	0	114	149	0	52	82	11				760
2:00-2:30	203	113	3	109	153	2	30	91	15				719
2:30-3:00	281	95	2	102	167	0	44	90	24				805
3:00-3:30	319	89	0	103	297	2	48	75	19				952
3:30-4:00	383	69	0	76	348	1	44	96	21				1038
4:00-4:30	499	49	0	58	453	1	39	82	13				1194
4:30-5:00	518	43	0	91	404	0	43	94	43				1236
5:00-5:30	563	29	0	87	438	0	61	104	48				1330
5:30-6:00	400	24	0	77	349	0	34	72	30				986
6:00-6:30													
6:30-7:00													
AM 7:30	484	299	2	285	306	5	90	171	76				1718
7:30-8:00													
8:00-8:30													
PM :00	1081	72	0	178	842	0	104	198	91				2566
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	6486	2194	24	2475	4653	20	825	1834	535				GRAND TOTAL
Total of L S & R	8704			7148			3194						19,046

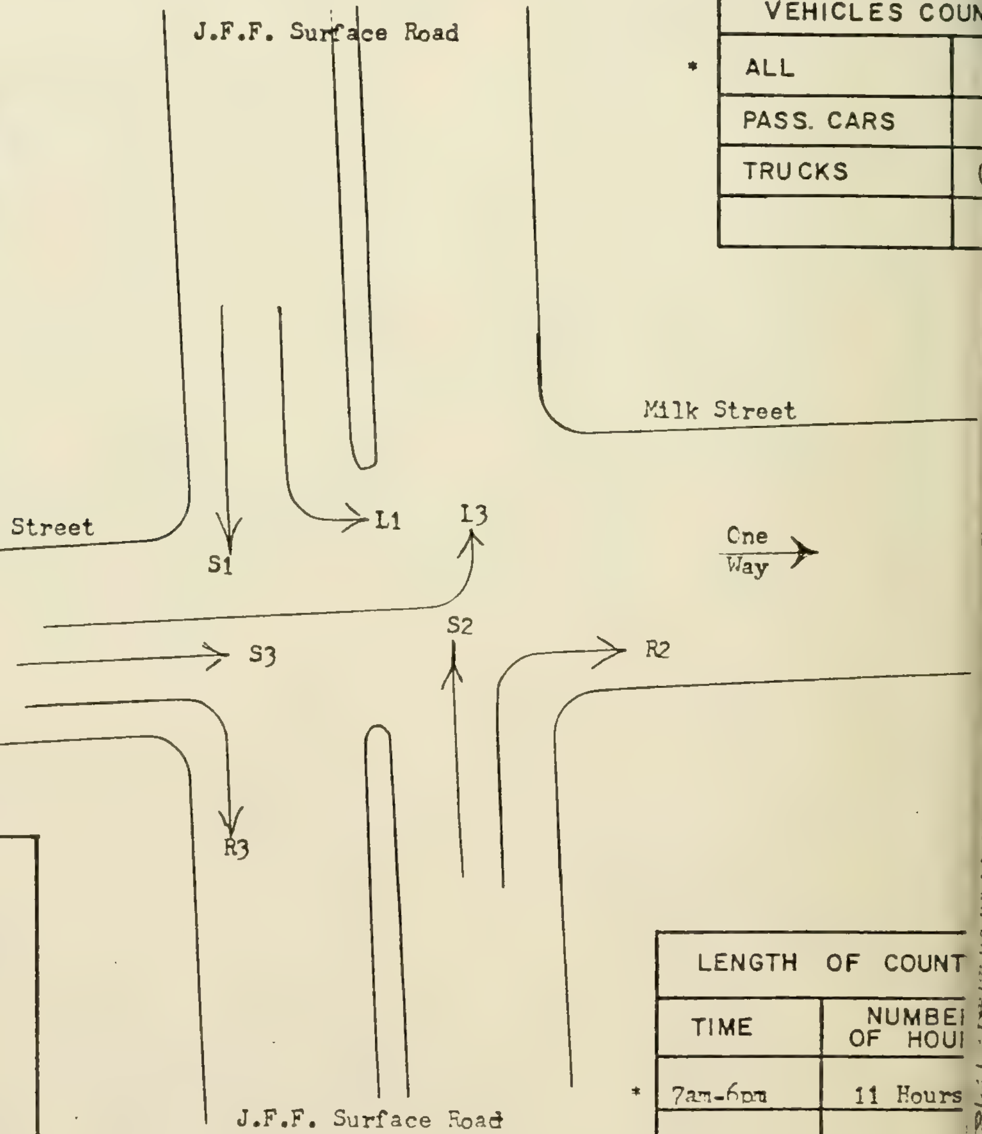
Traffic Control Systems
Planning, Engineering, Construction & Maintenance
Brighton, Ma. Tel. (617) 782-9757

INT. NO. 319

CITY Boston Proper
INTERSECTION J.F.F. Surface Road & Milk Street
DATE 11/24 & 25/80 DAY OF WEEK M T

INTERSECTION TURNING MOVEMENT COUNT

1052



VEHICLES COUN	
* ALL	
PASS. CARS	
TRUCKS	(

WEATHER

Rain

COUNT TAKEN BY

E.C.

LENGTH OF COUNT	
TIME	NUMBER OF HOU
* 7am-6pm	11 Hours

STREET		ENTERING VOLUME	FLOW PERCENT
J.F.F. Surface Rd.	SB	6544	43.6
J.F.F. Surface Rd.	NB	7028	46.9
Milk Street	EB	1424	9.5
		14006	100%

COMMENTS

ffic Control Systems STA. NO.

Planning, Engineering, Construction, & Maintenance 319

Brighton, Ma. Tel. (617) 782-9757

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION J.F.F. Surface Road & Milk Street CITY OR TOWN Boston Proper

DATE 11/24 & 25/80 DAY OF WEEK Mon & Tues. WEATHER Rain RECORDER E.C.

TIME STARTS __M	Surface Road Southbound			Surface Road Northbound			Milk Street Eastbound						TOTAL HALF HOUR TALLY
	L1	S1			S2	R2	L3	S3	R3				
7:00-7:30	5	172			156	2	2	8	1				346
7:30-8:00	21	258			304	6	5	19	1				614
8:00-8:30	24	220			331	4	8	23	3				613
8:30-9:00	43	203			395	9	11	30	3				694
9:00-9:30	39	187			323	14	16	32	4				615
9:30-10:00	24	168			339	11	37	30	6				615
10:00-10:30	39	317			213	6	22	15	7				619
10:30-11:00	31	284			204	9	27	23	11				589
11:00-11:30	24	155			186	12	23	18	8				426
11:30-12:00	22	163			223	14	29	28	9				488
12:00-12:30	31	221			345	13	37	41	6				694
12:30-1:00	14	224			301	9	36	19	10				613
1:00-1:30	22	252			268	15	33	21	12				623
1:30-2:00	38	283			245	13	28	20	13				640
2:00-2:30	28	288			262	11	31	22	11				653
2:30-3:00	21	303			279	13	33	27	12				688
3:00-3:30	24	420			319	8	38	46	8				863
3:30-4:00	23	433			362	14	34	41	10				917
4:00-4:30	21	440			478	25	37	33	2				1036
4:30-5:00	26	392			515	23	43	39	11				1049
5:00-5:30	12	330			381	12	73	46	10				864
5:30-6:00	15	284			343	13	36	37	9				737
6:00-6:30													
6:30-7:00 PM	67	423			726	13	19	53	6				1,307
7:00-7:30													
7:30-8:00													
8:00-8:30 PM	47	832			993	48	80	72	13				2085
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	5[illegible]7	[illegible]77			[illegible]3	[illegible]56	639	618	167				GRAND TOTAL
TOTAL OF __		.574			.28			1424					14996

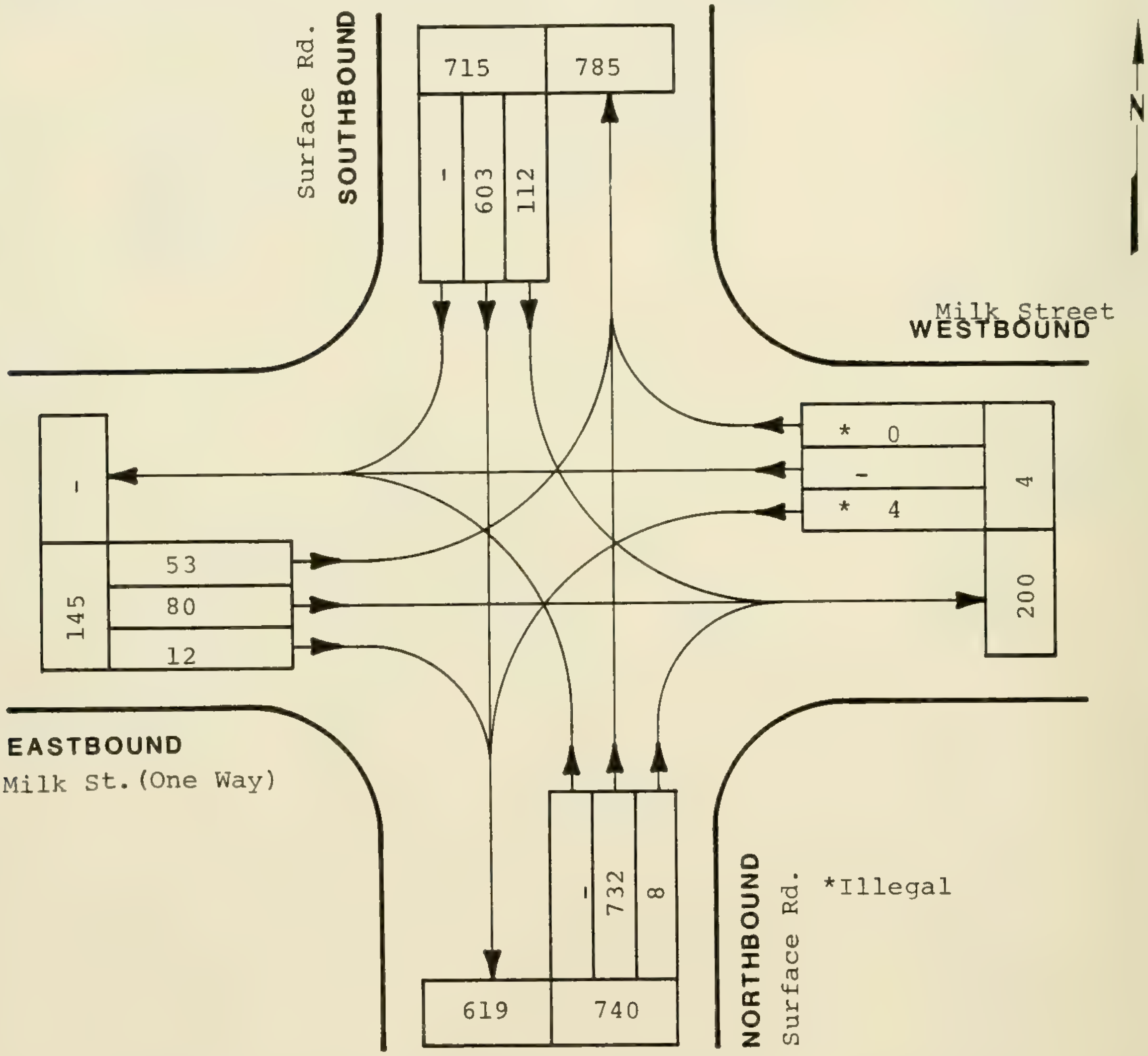
VH

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 7/26/84 DAY of WEEK Thursday

INTERSECTION Milk St./Surface Road JOB No. 0923



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Surface Rd. (NB)	740	46.1%	8:00 - 9:00 AM
Surface Rd. (SB)	715	44.6%	
Milk St. (EB)	145	9.0%	AM Peak Hour
Milk St. (WB)	4	0.3%	
			VEHICLES COUNTED
			ALL VEHICLES XXX 1604
			TRUCKS (XX)
TOTAL	1604	100.0%	PERCENT TRUCKS %

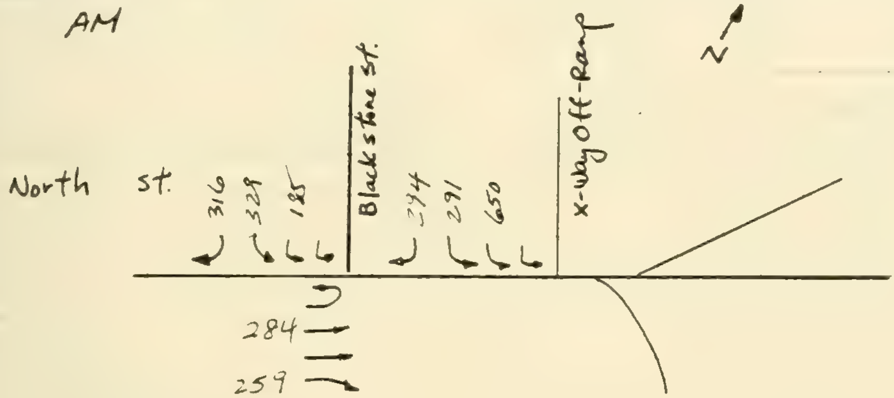
VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

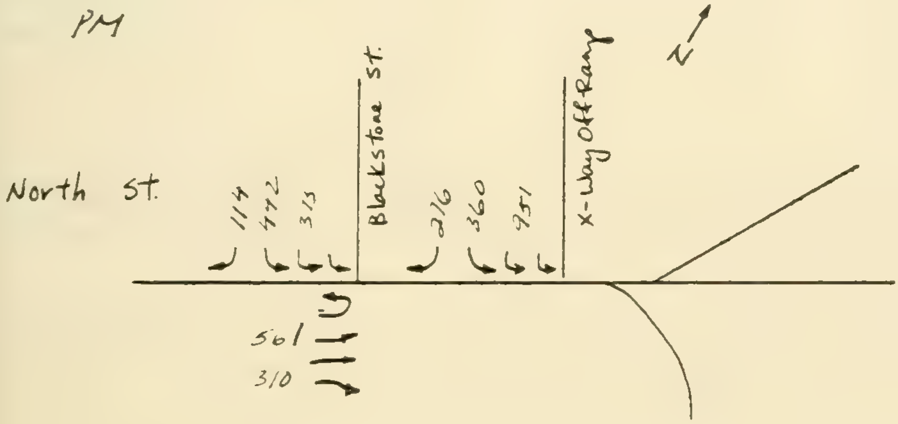
JOB International Place JOB No. 0923
LOCATION ______ SHEET ____ OF ____
CALCULATED BY BG DATE ______
CHECKED BY ______ DATE ______
TITLE ______

AM

Source: Third Harbor Tunnel EIR dated Dec. 82.



PM



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Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB International Place JOB No. 0923

LOCATION ______ SHEET ____ OF ____

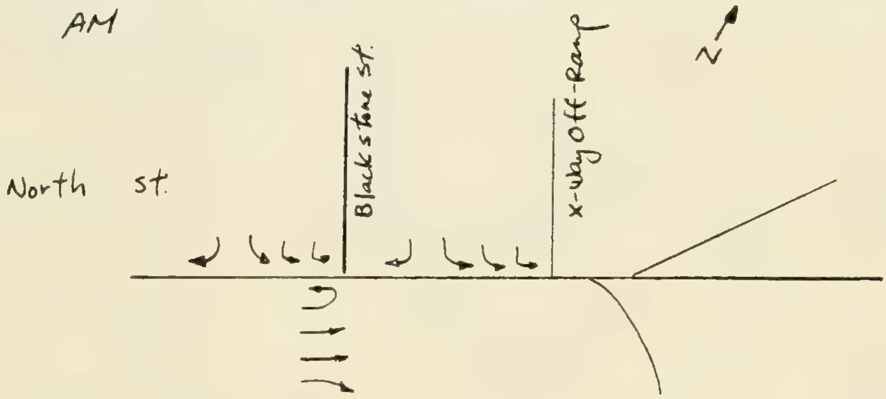
CALCULATED BY BG DATE ______

CHECKED BY ______ DATE ______

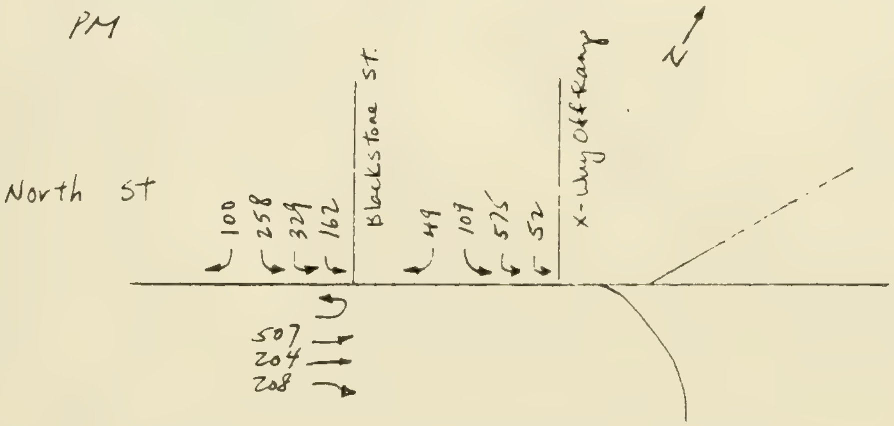
TITLE ______

AM

Source: Marketplace Center EIR dated April, 83.

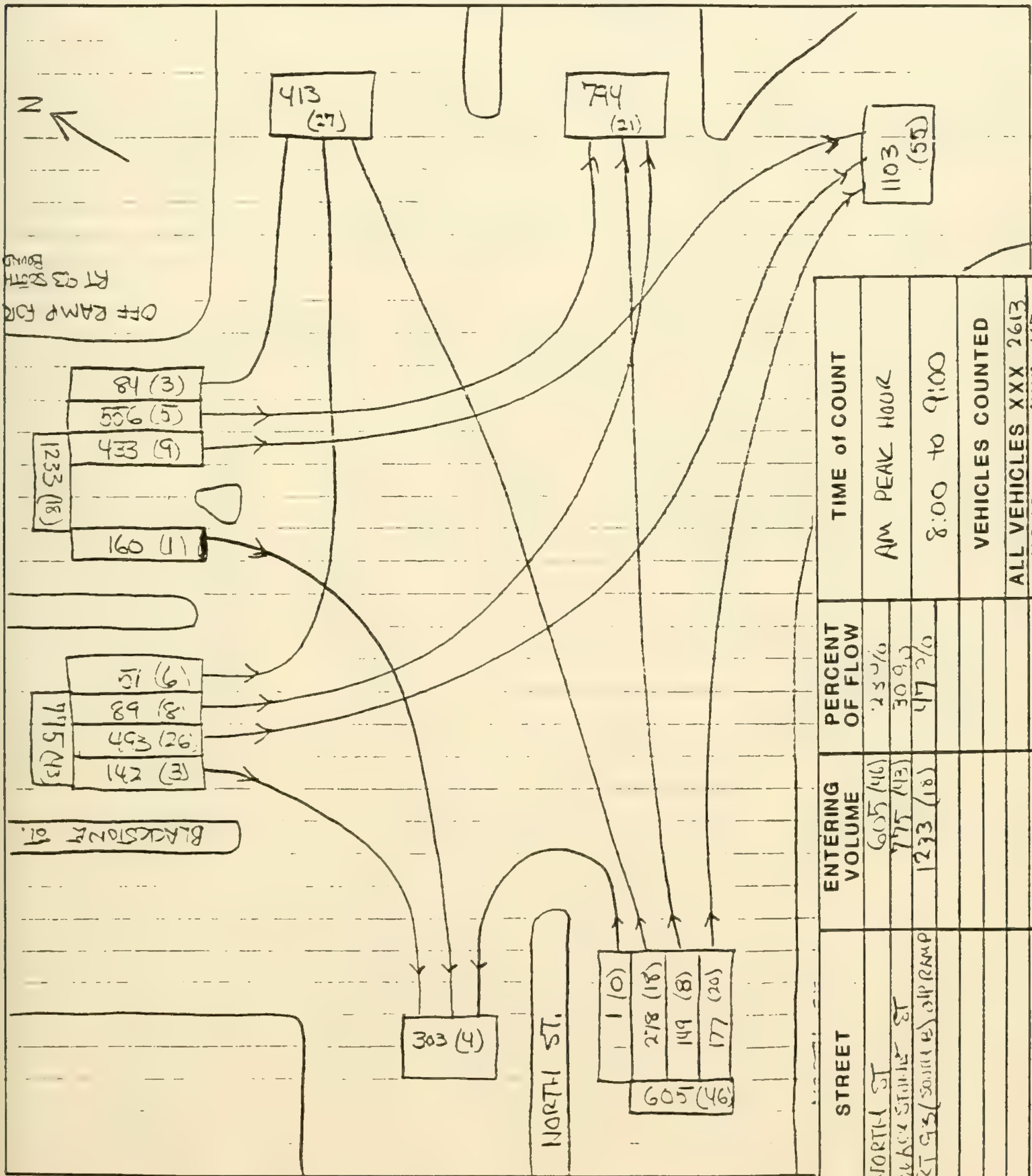


PM



VH
Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB HOLIDAY INN   JOB No. 556
LOCATION NORTH ST / BLACKSTONE   SHEET 1 OF 3
CALCULATED BY AND RT 93 OFF RAMP   DATE FRIDAY
CHECKED BY GJD   DATE 7/13/84
TITLE AM COUNT



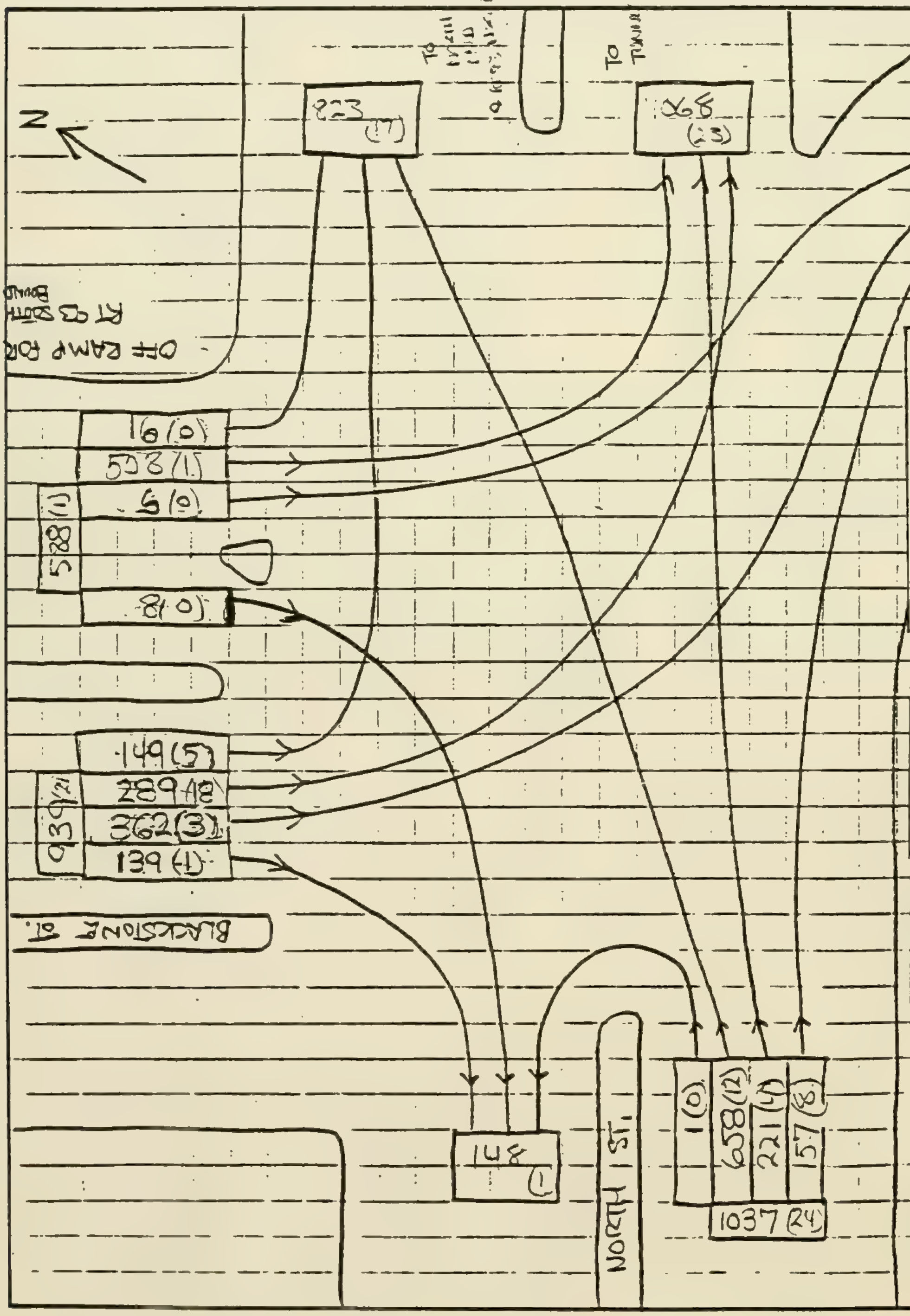
TIME of COUNT	
AM PEAK HOUR	
8:00 to 9:00	
VEHICLES COUNTED	
ALL VEHICLES XXX	2613
TRUCKS (XX)	107
PERCENT TRUCKS	[illegible]

STREET	ENTERING VOLUME	PERCENT OF FLOW
NORTH ST	605 (46)	23%
BLACKSTONE ST	775 (43)	30%
RT 93 (SOUTH B) OFF RAMP	1233 (18)	47%

VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: HOLIDAY INN JOB No. 296
LOCATION: NORTH / BLACKSTONE / RT 93 RAMP SHEET 1 OF 5
CALCULATED BY: DATE: FRIDAY
CHECKED BY: DATE: 7/13/84
TITLE: PM COUNT



TIME of COUNT: P.M. PEAK HOUR, 4:15 pm to 5:15 pm

VEHICLES COUNTED
ALL VEHICLES XXX 2564
TRUCKS (XX) 52
PERCENT TRUCKS 2.0 %

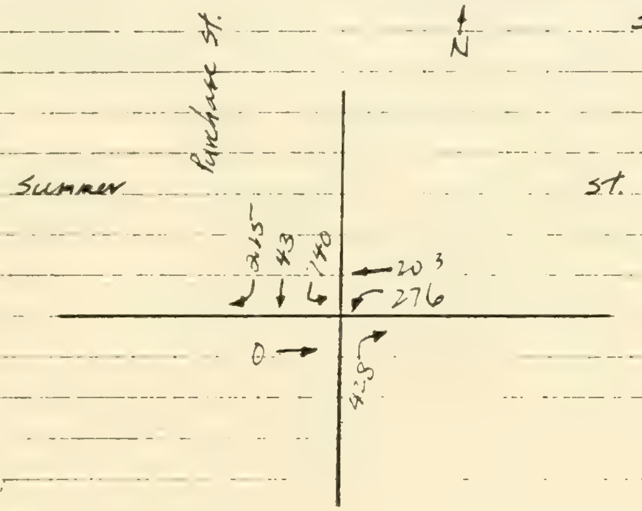
STREET	ENTERING VOLUME	PERCENT OF FLOW
NORTH ST.	1037 (24)	40%
BLACKSTONE ST.	939 (21)	37%
RT 93 / ... Ramp	588 (1)	23%
TOTAL	2564	100%

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

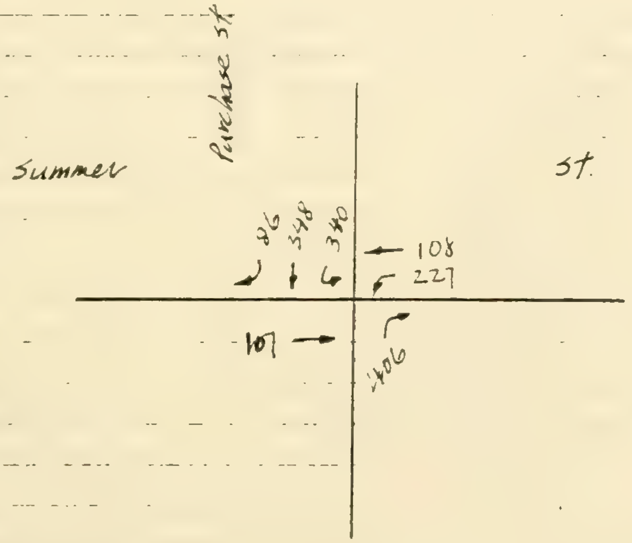
JOB: International Place JOB No. 0923
LOCATION: ____ SHEET ____ OF ____
CALCULATED BY: BG DATE: ____
CHECKED BY: ____ DATE: ____
TITLE: Turning Movement Counts

AM

Source: Dewey Sq. TSM Study



PM



Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923

LOCATION: ______ SHEET ___ OF ___

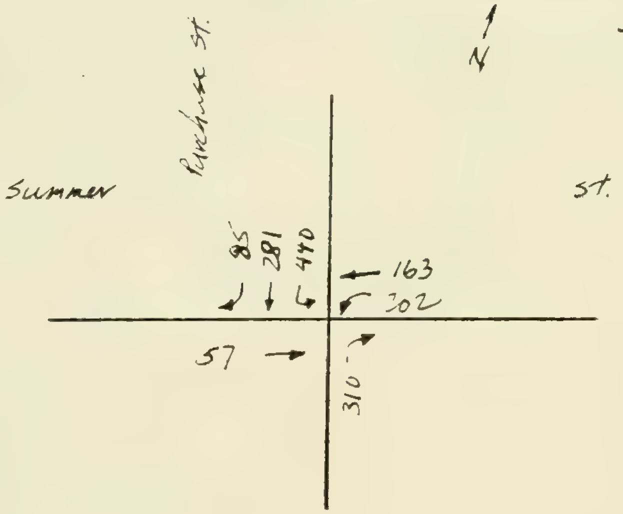
CALCULATED BY: BG DATE: ______

CHECKED BY: ______ DATE: ______

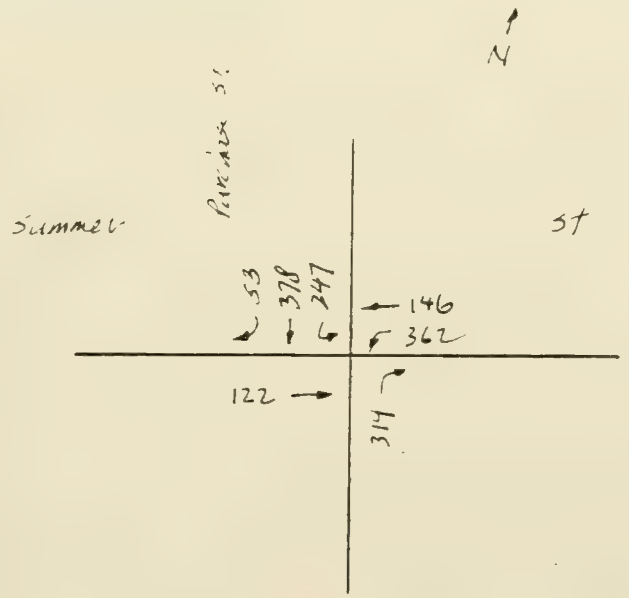
TITLE: Turning Movement Counts

AM

Source:



PM

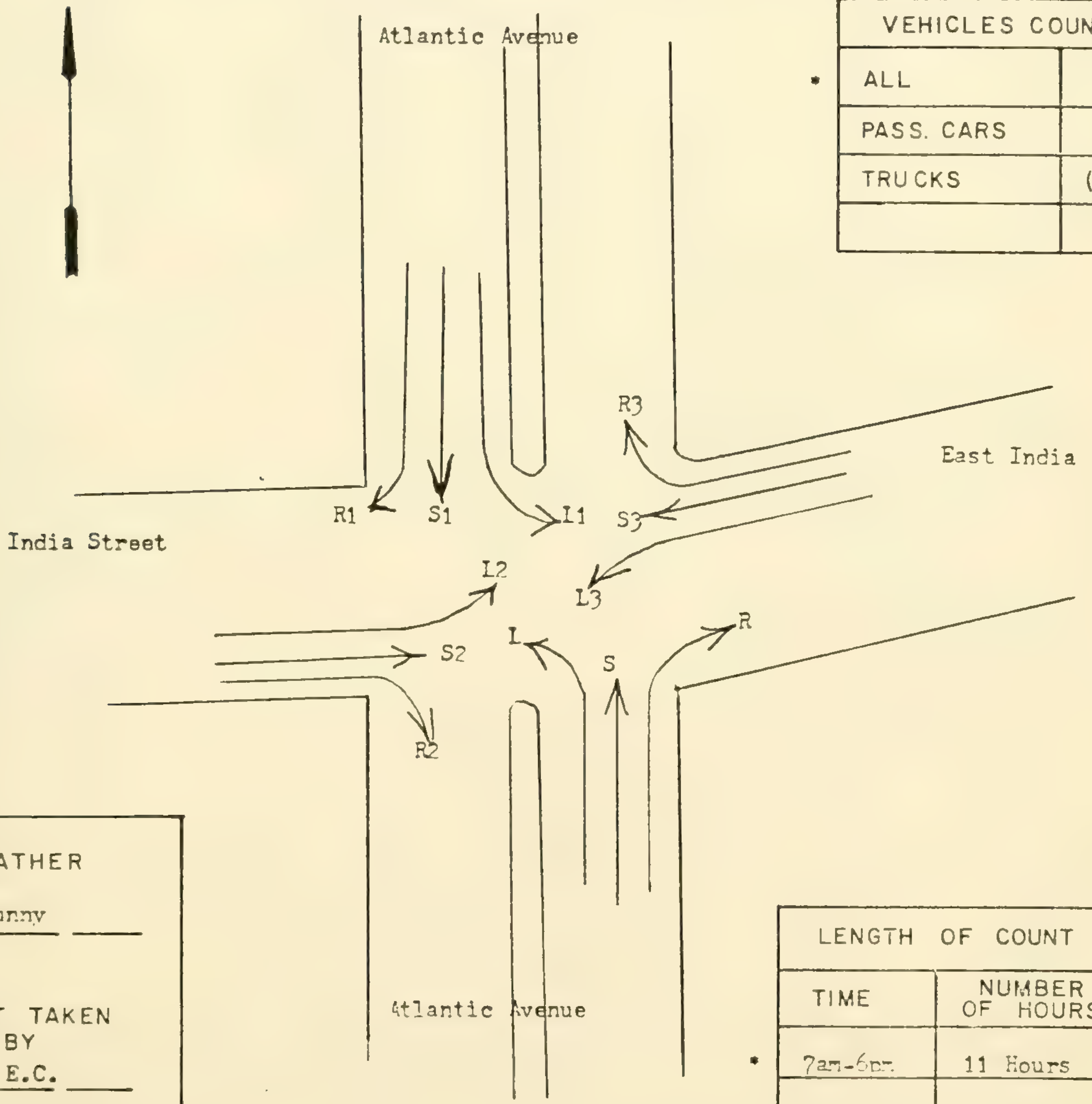


Traffic Control Systems
Planning, Engineering, Construction & Maintenance
Brighton, Ma. Tel. (617) 782-9757

INT. NO. 387

CITY Boston Proper
INTERSECTION Atlantic Ave., East India Ro[w] & India Street
DATE 4/8/81 DAY OF WEEK Wednes[day]

N INTERSECTION TURNING MOVEMENT COUNT # 200



VEHICLES COUNTED	
ALL	X
PASS. CARS	
TRUCKS	(X)

WEATHER

Sunny

COUNT TAKEN BY

D.B. & E.C.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
7am-6pm	11 Hours

STREET		ENTERING VOLUME	FLOW PERCENT
Atlantic Avenue	NB	6677	58.4
Atlantic Avenue	SB	3695	32.3
India Street	EB	490	4.3
East India Street	WB	566	5.0
TOTAL		11428	100%

COMMENTS

Traffic Control Systems
Planning, Engineering, Construction, & Maintenance
Brighton, Ma. Tel. (617) 782-9757

STA. NO. 387

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION Atlantic Ave., East India Row, & India St. CITY OR TOWN Boston Proper

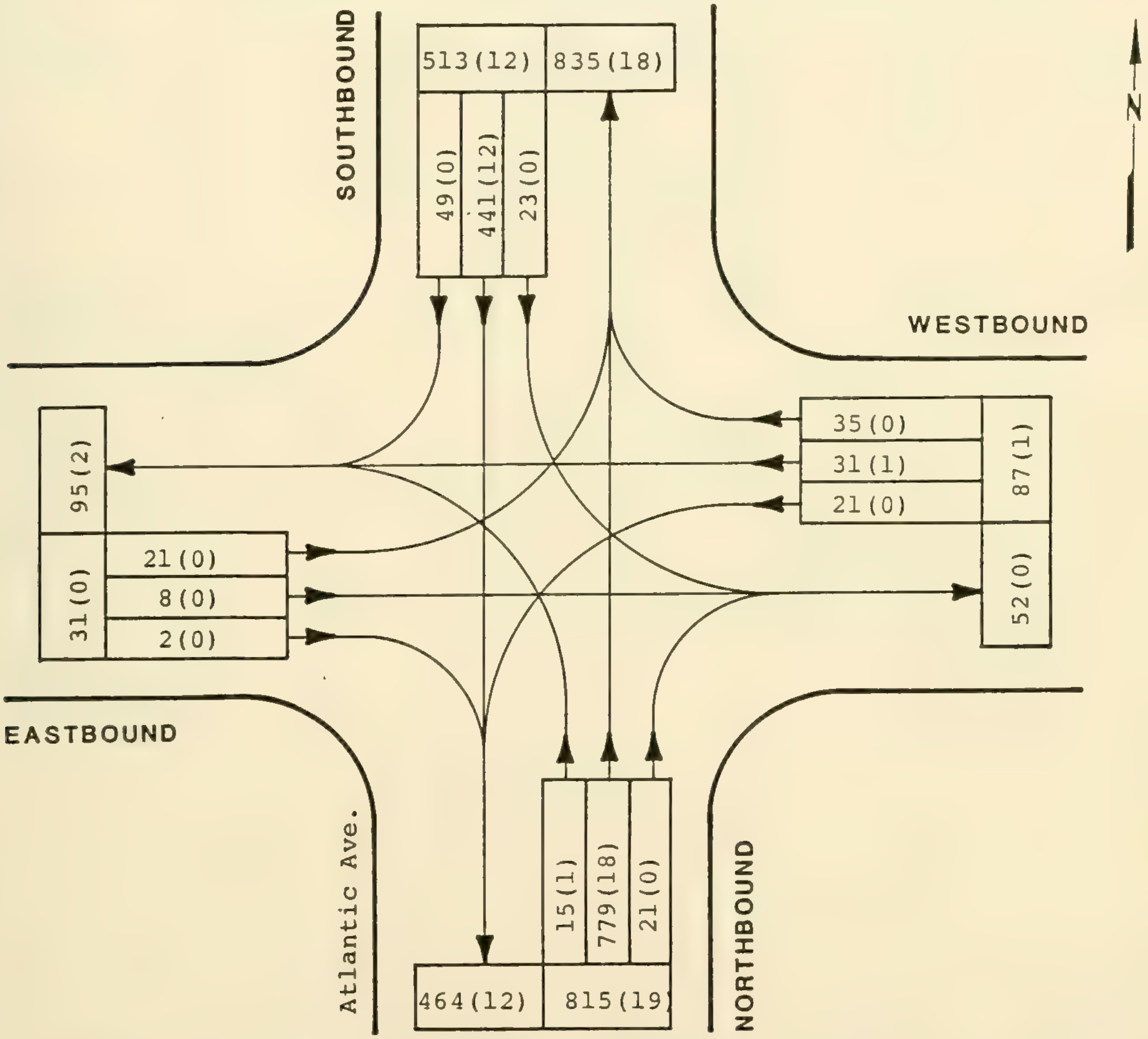
DATE 4/8/81 DAY OF WEEK Wednesday WEATHER Sunny RECORDER D.B. & E.

TIME STARTS __M	Atlantic Avenue Northbound			Atlantic Avenue Southbound			India Street Eastbound			East India Street Westbound			TOTA[L] HALF HO[UR] TALL[Y]
	L	S	R	L1	S1	R1	L2	S2	R2	L3	S3	R3	
7:00-7:30	2	221	5	8	147	8	1	5	1	3	11	7	41
7:30-8:00	3	263	12	6	220	23	4	8	1	8	14	14	57
8:00-8:30	10	343	12	10	192	16	9	14	0	8	26	16	65
8:30-9:00	11	426	10	11	159	27	2	4	3	10	17	7	68
9:00-9:30	13	370	13	7	171	19	11	10	2	10	15	12	65
9:30-10:00	8	237	11	5	104	8	6	8	1	5	9	9	41
10:00-10:30	9	320	12	6	123	11	12	5	2	2	14	7	52
10:30-11:00	11	235	11	9	131	12	7	8	1	8	14	10	45
11:00-11:30	9	230	10	3	122	8	15	7	2	3	8	15	43
11:30-12:00	19	256	8	2	128	11	15	9	4	2	8	9	47
12:00-12:30	9	270	4	9	127	12	13	8	1	3	6	6	46
12:30-1:00	16	246	3	19	105	13	10	7	4	5	12	11	45
1:00-1:30	20	209	8	3	115	22	15	9	1	2	9	7	42
1:30-2:00	12	196	5	4	102	12	11	8	2	2	8	4	36
2:00-2:30	17	256	9	5	133	16	15	11	1	6	9	10	48
2:30-3:00	15	243	11	7	129	19	12	7	2	3	11	13	47
3:00-3:30	13	254	9	6	136	12	9	8	3	5	12	9	47
3:30-4:00	7	329	6	4	173	3	1	2	14	0	3	8	55
4:00-4:30	18	436	14	11	268	11	34	8	13	0	4	11	82
4:30-5:00	11	401	8	5	212	7	29	6	7	8	9	14	71
5:00-5:30	5	289	9	3	161	6	12	4	2	3	10	17	52
5:30-6:00	6	201	11	4	107	8	16	5	3	5	7	12	38
6:00-6:30													
6:30-7:00													
AM 7:00-7:30	21	769	22	21	351	43	11	18	3	18	43	23	1344
7:30-8:00													
8:00-8:30													
PM 8:30-9:00	21	837	22	16	480	18	63	14	20	8	13	25	1545
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	[illegible]	6231	202	147	3265	284	259	161	70	101	236	228	GRAN[D] TOTA[L]
TOTAL OF	6677			3696			490			565			1142

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 3/2/84 DAY of WEEK Friday
INTERSECTION Atlantic Ave. & E. India Row JOB No. 0751

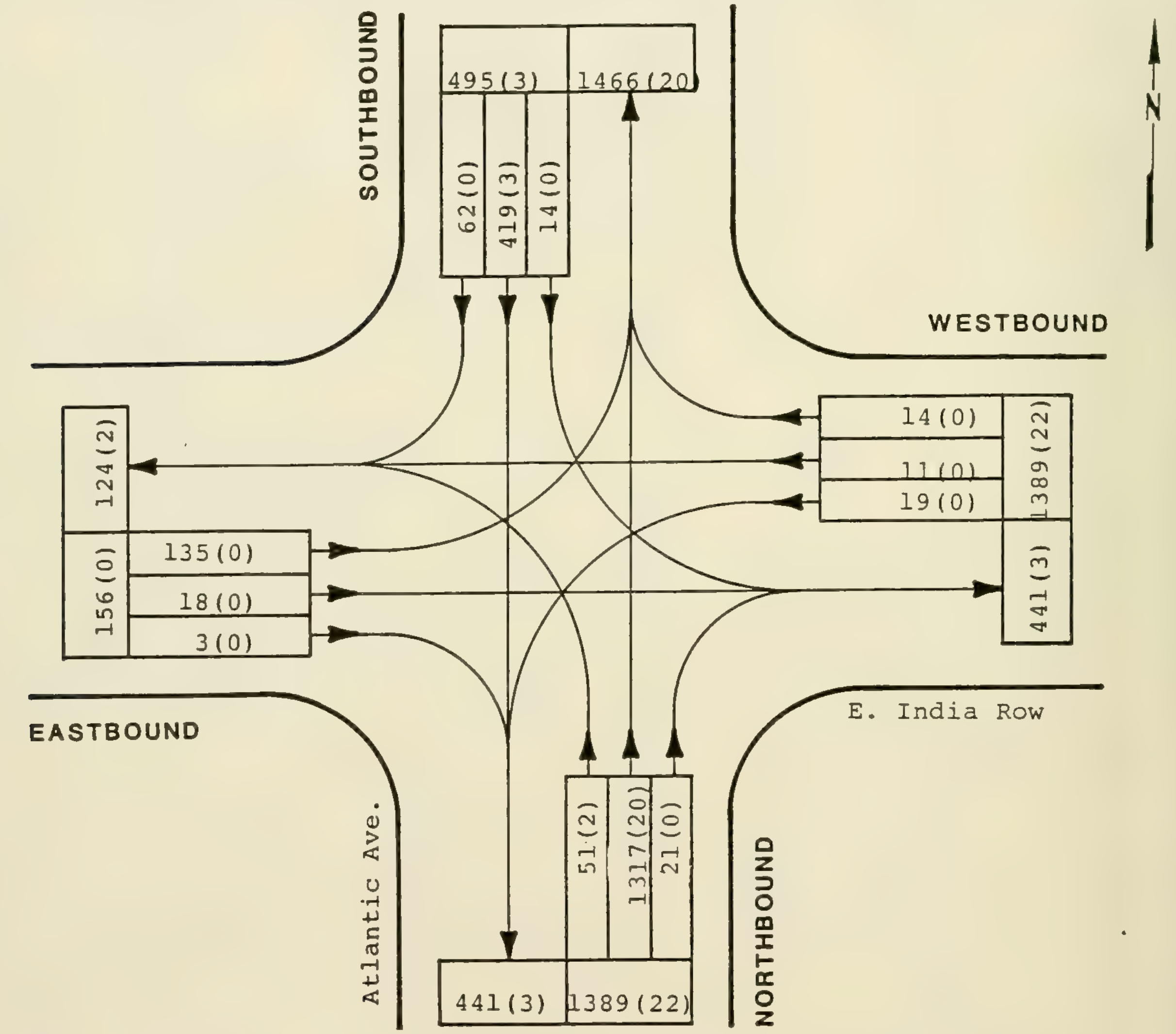


STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Atlantic Ave. (NB)	815(19)	56.4%	
Atlantic Ave. (SB)	513(12)	35.5%	8:00 - 9:00 AM
E.India Row (EB)	31(0)	2.1%	
E.India Row (WB)	87(1)	6.0%	AM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 1446
			TRUCKS (XX) 32
TOTAL	1446(32)	100.0%	PERCENT TRUCKS 2.2%

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

INTERSECTION TURNING MOVEMENT COUNT

CITY Boston, MA DATE 3/1/84 DAY of WEEK Thursday
INTERSECTION Atlantic Ave. & E. India Row JOB No. 0751



STREET	ENTERING VOLUME	PERCENT OF FLOW	TIME of COUNT
Atlantic Ave. (NB)	1389(22)	66.7%	
Atlantic Ave. (SB)	495(3)	23.8%	4:30 - 5:30 PM
E. India Row (EB)	156(0)	7.5%	
E. India Row (WB)	44(0)	2.0%	PM Peak Hour
			VEHICLES COUNTED
			ALL VEHICLES XXX 2084
			TRUCKS (XX) 25
TOTAL	2084(25)	100.0%	PERCENT TRUCKS 1.2 %

Traffic Control Systems
Planning, Engineering, Construction & Maintenance
Brighton, Ma. Tel. (617) 782-9757

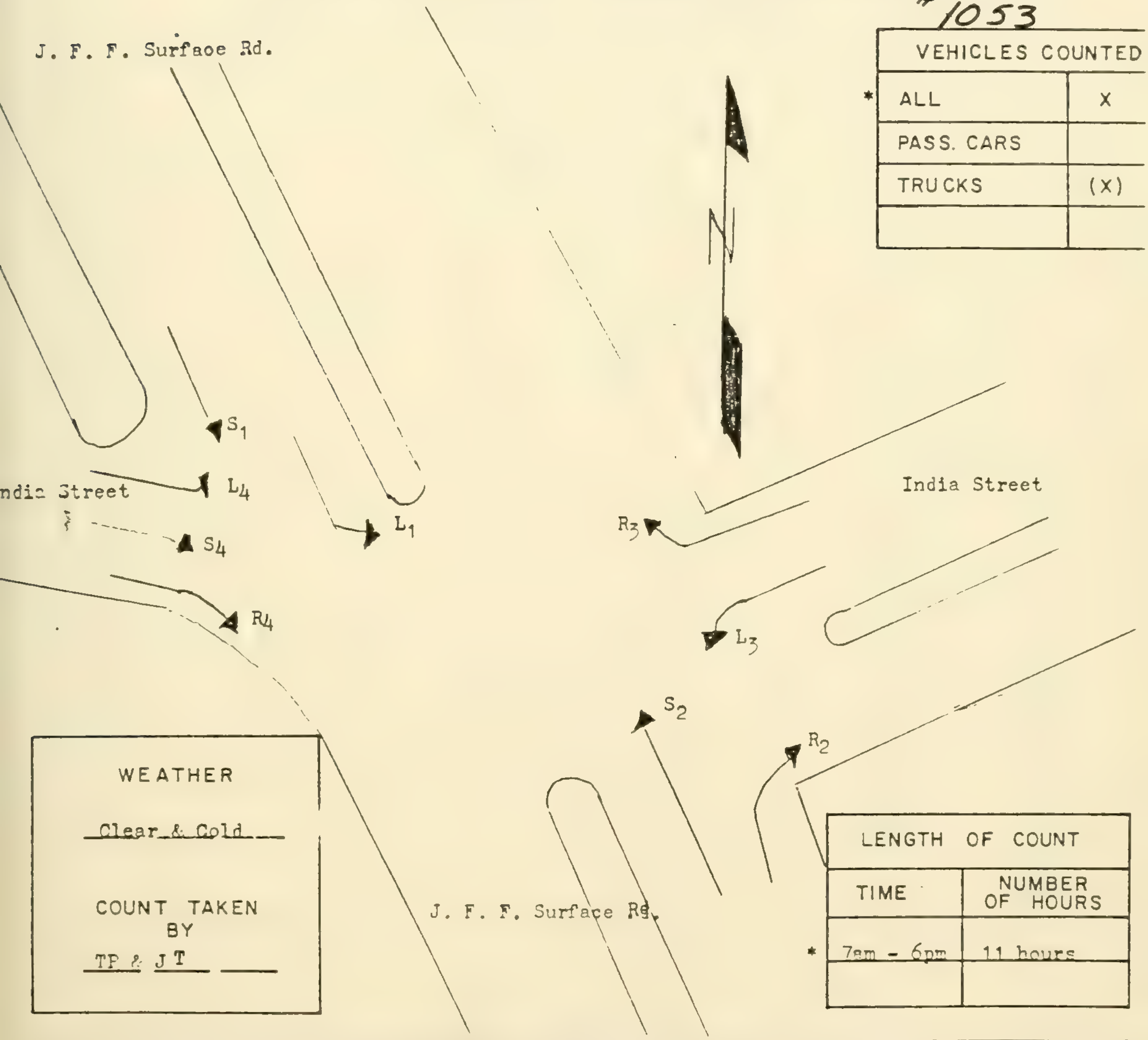
INT. NO. 86

CITY Boston Proper
INTERSECTION India Street & J. F. F. Surface Rd.
DATE 11/16&19/79 DAY OF WEEK Fri & M

INTERSECTION TURNING MOVEMENT COUNT

#1053

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER

Clear & Cold

COUNT TAKEN BY

TP & JT

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am - 6pm	11 hours

STREET	ENTERING VOLUME	FLOW PERCENT	COMMENTS
Surface Rd. SB	5755	33.6%	
Surface Rd. NB	8848	51.7%	
India Street WB	1101	6.0%	
India Street EB	1300	7.4%	
TOTAL	[illegible]	[illegible]	

Planning, Engineering, Construction and Maintenance
Brighton, Ma. Tel. (617) 782-9757

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION India Street & J. F. K. Surface Rd. CITY OR TOWN Boston Proper

DATE 11/16 & 19/79 DAY OF WEEK Fri & Mon WEATHER Clear & Cold RECORDER TP & JT

1053

TIME STARTS __ M	Surface Rd. Southbound			Surface Rd. Northbound			India Street Westbound			India Street Eastbound			TOTAL HALF H...
	L_1	S_1			S_2	R_2	L_3		R_3	L_4	S_4	R_4	TAL
7:00-7:30	7	182			309	9	31		19	6	6	28	59...
7:30-8:00	13	176			347	10	35		23	5	11	30	646
8:00-8:30	11	216			411	15	41		24	8	12	31	76...
8:30-9:00	14	189			357	12	38		13	6	9	36	69...
9:00-9:30	10	163			284	4	40		21	5	6	24	55...
9:30-10:00	12	184			314	7	36		21	6	10	37	6...
10:00-10:30	11	190			286	15	35		23	4	5	35	60...
10:30-11:00	11	144			262	12	42		21	9	11	35	64...
11:00-11:30	10	200			314	12	27		22	6	12	50	66...
11:30-12:00	14	204			317	14	30		15	13	10	51	67...
12:00-12:30	17	263			219	13	52		21	9	8	56	69...
12:30-1:00	10	244			322	11	40		14	11	7	49	71...
1:00-1:30	7	216			303	8	30		12	6	5	45	63...
1:30-2:00	5	252			253	8	41		15	9	5	63	65...
2:00-2:30	8	209			296	9	29		18	12	11	39	63...
2:30-3:00	6	264			292	7	24		12	5	9	22	65...
3:00-3:30	17	211			302	8	36		15	10	12	44	65...
3:30-4:00	40	253			465	12	37		27	2	7	33	98...
4:00-4:30	20	436			697	25	32		13	7	5	63	129...
4:30-5:00	14	440			692	14	46		13	6	4	21	13...
5:00-5:30	6	425			678	15	40		11	5	6	26	13...
5:30-6:00	10	359			540	11	31		16	8	6	59	10...
6:00-6:30													
6:30-7:00													
AM 7:00-7:30	25	405			798	27	79		37	14	2[illegible]	57	
7:30-8:00													
8:00-8:30													
PM 8:30-9:00	34	876			1389	39	78		210	8	9	84	
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	272	5412			7500	251	803		[illegible]	[illegible]	[illegible]	[illegible]	GRAND TOT...
TOTAL OF ...		5756			3348		[illegible]			[illegible]			171...

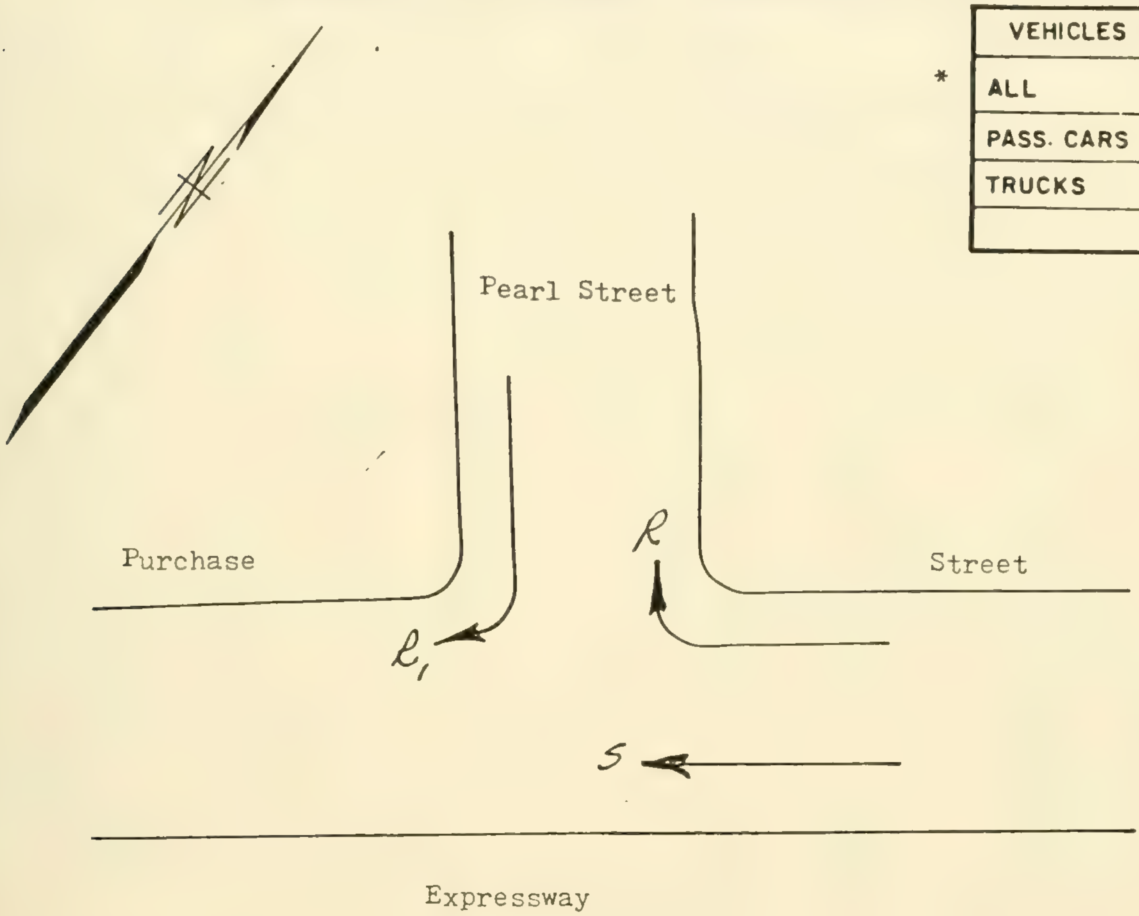
PLANNING ENGINEERING & DEVELOPMENT

CITY	Boston Proper
INTERSECTION	Pearl Street & Purchase Street
DATE	*
DAY OF WEEK	Thur-Fri

INT. NO. * 7/30&31/79

INTERSECTION TURNING MOVEMENT COUNT #59 BRA #602

VEHICLES COUNTED	
* ALL	X
PASS. CARS	
TRUCKS	(X)



WEATHER

Fair

COUNT TAKEN BY

W.C.

LENGTH OF COUNT	
TIME	NUMBER OF HOURS
* 7am-6pm	11 hours

STREET		ENTERING VOLUME	FLOW PERCENT
Purchase St.	SB	8593	99.8
Pearl St.	EB	16	0.2
TOTAL		9609	100.0%

COMMENTS

PLANNING ENGINEERING & DEVELOPMENT STA.NO. 5
BR

TRAFFIC MOVEMENT SUMMARY TABLE

LOCATION Pearl Street & Purchase Street CITY OR TOWN Boston Proper

DATE 7/30&31/79 DAY OF WEEK Thur-Fri WEATHER Fair RECORDER W.C.

~~#602~~

TIME STARTS __M	Purchase St.			Pearl Street									TOTAL HALF HOUR TALLY
	Southbound			Eastbound									
	S		R		R1								
7:00-7:30	385		9		1								39
7:30-8:00	445		20		1								46
8:00-8:30	502		28		2								53
8:30-9:00	402		23		0								42
9:00-9:30	402		14		0								41
9:30-10:00	315		7		1								32
10:00-10:30	329		22		0								35
10:30-11:00	276		12		0								28
11:00-11:30	278		22		0								30
11:30-12:00	318		12		0								33
12:00-12:30	387		18		0								40
12:30-1:00	340		18		0								35
1:00-1:30	366		23		0								38
1:30-2:00	318		24		1								34
2:00-2:30	370		18		0								38
2:30-3:00	357		22		0								37
3:00-3:30	362		26		3								39
3:30-4:00	400		21		3								42
4:00-4:30	425		14		1								44
4:30-5:00	440		14		2								45
5:00-5:30	413		11		0								42
5:30-6:00	368		17		1								38
6:00-6:30													
6:30-7:00													
7:00-7:30													
7:30-8:00													
8:00-8:30													
8:30-9:00													
9:00-9:30													
9:30-10:00													
10:00-10:30													
10:30-11:00													
TOTAL	8198		395		16								GRAND TOTAL
TOTAL OF L.S.B.R	8593			16									860

MECHANICAL RECORDER COUNT RECORD

VH
Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

CALCULATED BY: PD/SS DATE 19 December 81
CITY / TOWN: Boston STATE MA
LOCATION: Central Artery Off Ramp at Atlantic Ave/ Northern Ave.
DIR. Northbound JOB No. 0121-10 SHEET 1 OF 1

TIME \ MONTH 11/81	Sun.	Mon. 16	Tue. 17	Wed. 18	Thu. 19	Fri. 20	Sat.	TOTAL
12 - 1 A.M.			53	46				99
1 - 2 A.M.			21	28				49
2 - 3 A.M.			28	38				66
3 - 4 A.M.			21	16				37
4 - 5 A.M.			35	24				59
5 - 6 A.M.			125	114				239
6 - 7 A.M.			336	328				664
7 - 8 A.M.			575	632				1207
8 - 9 A.M.			1110	1004				2114
9 -10 A.M.			767	687				1454
10 -11 A.M.			430	412				842
11 -12 NOON		386	445	497				1328
12 - 1 P.M.		401	419	435				1255
1 - 2 P.M.		315	318	336				969
2 - 3 P.M.		331	326	344				1001
3 - 4 P.M.		468	583	625				1676
4 - 5 P.M.		459	729	829				2017
5 - 6 P.M.		694	714	485				1893
6 - 7 P.M.		330	308	679				1317
7 - 8 P.M.		212	279	389				880
8 - 9 P.M.		126	162	106				394
9 -10 P.M.		100	142	80				322
10 -11 P.M.		111	103	61				275
11 - 12 MID.		62	96	39				197
TOTAL		3995	8125	8234				20354

Avg. Sat. ______ Avg. Sun. ______ Avg. Weekday 8,234

MECHANICAL RECORDER COUNT RECORD

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

CALCULATED BY: GT DATE: 10 December 81
CITY / TOWN: Boston STATE: MA
LOCATION: Northern Avenue Bridge
DIR. Total JOB No. 0121-10 SHEET 1 OF 1

TIME \ MONTH 11/81	Sun. 15	Mon. 16	Tue. 17	Wed. 18/11	Thu. 12	Fri. 13	Sat. 14	TOTAL
12 - 1 A.M.	399	98	90	107	76	137	243	1150
1 - 2 A.M.	169	29	43	32	42	76	132	523
2 - 3 A.M.	220	31	17	36	18	84	137	543
3 - 4 A.M.	35	21	12	19	20	35	34	176
4 - 5 A.M.	17	42	39	42	39	37	27	243
5 - 6 A.M.	26	192	149	143	180	169	46	905
6 - 7 A.M.	40	489	427	416	502	529	104	2507
7 - 8 A.M.	76	989	1044	998	1125	1114	227	5573
8 - 9 A.M.	92	1359	1416	1237	1470	1373	312	7268
9 -10 A.M.	129	1143	1025	1084	1249	1124	330	6084
10 -11 A.M.	194	799	811	738	726	926	504	4688
11 -12 NOON	356	754	905	862 ↑ 11/18	1076	1085	614	5652
12 - 1 P.M.	662	916	1029	↓ 11/11 897	1147	1321	745	6607
1 - 2 P.M.	676	831	1932	945	1163	1062	826	6535
2 - 3 P.M.	784	888	991	972	1183	1368	889	7075
3 - 4 P.M.	746	1179	1211	1055	1343	1448	985	7967
4 - 5 P.M.	799	1481	1308	1076	1639	1744	972	9019
5 - 6 P.M.	759	1563	1568	1107	1793	1591	907	9288
6 - 7 P.M.	548	999	1022	826	1175	1218	1040	6828
7 - 8 P.M.	523	668	703	757	772	1044	1069	5536
8 - 9 P.M.	378	524	605	582	673	867	1032	4661
9 -10 P.M.	231	529	460	529	607	824	909	3985
10 -11 P.M.	198	369	406	484	473	719	784	3433
11 - 12 MID.	138	225	323	269	392	668	750	2765
TOTAL	8075	16018	16636	15213	18892	20563	13614	109011

Avg. Sat. 13,614 Avg. Sun. 8,075 Avg. Weekday 20,563

MECHANICAL RECORDER COUNT SUMMARY

VANASSE HANGEN ASSOCIATES, INC.
TRANSPORTATION ENGINEERS & PLANNERS
184 HIGH STREET, BOSTON MA 02110
617-482-1870
CALCULATOR: WPA JOB NO: 0923
DATE: 7/25 YEAR: 1984 (WEDNESDAY)

LOCATION: SURFACE RD 20' S STATE ST
BOSTON, MA.
DIRECTION: TOTAL
COUNT INTERVAL: 60 minutes
START TIME: 4:00 P.M.
END TIME: 4:00 A.M.

TIME	SUN	MON	TUES	WED	THUR	FRI	SAT	TOTAL	WKDY HRLY AVG
AM									
12-01	0	0	0	0	473	485	0	958	479
01-02	0	0	0	0	313	371	0	684	342
02-03	0	0	0	0	164	235	0	399	200
03-04	0	0	0	0	90	75	0	165	83
04-05	0	0	0	0	28	0	0	28	28
05-06	0	0	0	0	79	0	0	79	79
06-07	0	0	0	0	418	0	0	418	418
07-08	0	0	0	0	848	0	0	848	848
08-09	0	0	0	0	733	0	0	733	733
09-10	0	0	0	0	804	0	0	804	804
10-11	0	0	0	0	1219	0	0	1219	1219
11-12N	0	0	0	0	1360	0	0	1360	1360
PM									
12-01	0	0	0	0	1148	0	0	1148	1148
01-02	0	0	0	0	1190	0	0	1190	1190
02-03	0	0	0	0	1177	0	0	1177	1177
03-04	0	0	0	0	1579	0	0	1579	1579
04-05	0	0	0	1788	1953	0	0	3741	1871
05-06	0	0	0	2002	1760	0	0	3762	1881
06-07	0	0	0	1539	1300	0	0	2839	1420
07-08	0	0	0	1172	1014	0	0	2186	1093
08-09	0	0	0	957	881	0	0	1838	919
09-10	0	0	0	870	850	0	0	1720	860
10-11	0	0	0	757	892	0	0	1649	825
11-12M	0	0	0	583	675	0	0	1258	629
TOTAL	0	0	0	9668	21165	1166	0	31999	21589

AVERAGE WEEKDAY DAILY TRAFFIC: 21589 VEHICLES PER DAY (VPD)

AM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	MIDDAY PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	PM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
848	4 %	0	2170	10 %	0	2002	9 %	0

AM PEAK HOUR: 7:00- 8:00 M'DAY PEAK HR: 15:00- 16:00PM PEAK HOUR: 17:00- 18:0

AVERAGE SATURDAY: 0 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0

SATURDAY PEAK HOUR: 11:00-12:00

AVERAGE SUNDAY: 0 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0

SUNDAY PEAK HOUR: 11:00-12:00

MECHANICAL RECORDER COUNT RECORD

VH

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

CALCULATED BY: PD/SS DATE 19 November 81
CITY/TOWN: Boston STATE MA
LOCATION: Atlantic Ave. South Of Ramp/Northern Ave.
DIR. Northbound JOB No. 0121-10 SHEET 1 OF 1

TIME \ MONTH 11/81	Sun.	Mon. 16	Tue. 17	Wed. 18	Thu. 19	Fri. 20	Sat.	TOTAL
12 - 1 A.M.			112	133				245
1 - 2 A.M.			47	90				137
2 - 3 A.M.			62	65				127
3 - 4 A.M.			44	51				95
4 - 5 A.M.			76	83				159
5 - 6 A.M.			234	194				428
6 - 7 A.M.			505	616				1121
7 - 8 A.M.			1114	1203				2317
8 - 9 A.M.			1204	1245				2339
9 - 10 A.M.			989	1111				2093
10 - 11 A.M.			823	920				1743
11 - 12 NOON		911	951	1020				2882
12 - 1 P.M.		922	849	926				2697
1 - 2 P.M.		820	888	933				2641
2 - 3 P.M.		946	851	907				2704
3 - 4 P.M.		1032	1044	1277				3353
4 - 5 P.M.		1215	1307	1451				3973
5 - 6 P.M.		1354	1244	1441				4039
6 - 7 P.M.		868	788	1511				3167
7 - 8 P.M.		499	539	692				1730
8 - 9 P.M.		300	446	401				1147
9 - 10 P.M.		249	301	327				877
10 - 11 P.M.		183	201	260				644
11 - 12 MID.		137	189	180				506
TOTAL		9436	14801	17037				41274

Avg. Sat. ______ Avg. Sun. ______ Avg. Weekday 17,037

MECHANICAL RECORDER COUNT SUMMARY

VANASSE HANGEN ASSOCIATES, INC.
TRANSPORTATION ENGINEERS & PLANNERS
184 HIGH STREET, BOSTON MA 02110
617-482-1870
CALCULATOR: WPA JOB NO: 0923
DATE: 7/25 YEAR: 1984 (WEDNESDAY)

LOCATION: SURFACE RD 20' S STATE ST.
BOSTON, MA.
DIRECTION: NORTHBOUND
COUNT INTERVAL: 60 minutes
START TIME: 4:00 P.M.
END TIME: 4:00 A.M.

TIME	SUN	MON	TUES	WED	THUR	FRI	SAT	TOTAL	WKDY HRLY AVG
AM									
12-01	0	0	0	0	171	176	0	347	174
01-02	0	0	0	0	74	116	0	190	95
02-03	0	0	0	0	55	85	0	140	70
03-04	0	0	0	0	22	30	0	52	26
04-05	0	0	0	0	0	0	0	0	0
05-06	0	0	0	0	0	0	0	0	0
06-07	0	0	0	0	0	0	0	0	0
07-08	0	0	0	0	0	0	0	0	0
08-09	0	0	0	0	0	0	0	0	0
09-10	0	0	0	0	0	0	0	0	0
10-11	0	0	0	0	575	0	0	575	575
11-12N	0	0	0	0	612	0	0	612	612
PM									
12-01	0	0	0	0	448	0	0	448	448
01-02	0	0	0	0	474	0	0	474	474
02-03	0	0	0	0	500	0	0	500	500
03-04	0	0	0	0	831	0	0	831	831
04-05	0	0	0	1091	1053	0	0	2144	1072
05-06	0	0	0	1275	1047	0	0	2322	1161
06-07	0	0	0	759	668	0	0	1427	714
07-08	0	0	0	441	375	0	0	816	408
08-09	0	0	0	371	372	0	0	743	372
09-10	0	0	0	315	329	0	0	644	322
10-11	0	0	0	270	308	0	0	578	289
11-12M	0	0	0	225	256	0	0	481	241
TOTAL	0	0	0	4747	8170	407	0	13324	8495

AVERAGE WEEKDAY DAILY TRAFFIC: 8495 VEHICLES PER DAY (VPD)

AM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	MIDDAY PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	PM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0	1053	12 %	0	1275	15 %	0

AM PEAK HOUR: -1:00- 0:00 M'DAY PEAK HR: 15:00- 16:00PM PEAK HOUR: 17:00- 18:0

AVERAGE SATURDAY: 0 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0

SATURDAY PEAK HOUR: 11:00-12:00

AVERAGE SUNDAY: 0 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0

SUNDAY PEAK HOUR: 11:00-12:00

MECHANICAL RECORDER COUNT SUMMARY

VANASSE HANGEN ASSOCIATES, INC.
TRANSPORTATION ENGINEERS & PLANNERS
184 HIGH STREET, BOSTON MA 02110
617-482-1870
CALCULATOR: WPA JOB NO: 0923
DATE: 7/25 YEAR: 1984 (WEDNESDAY)

LOCATION: SURFACE RD. 20' S STATE ST.
BOSTON MA.
DIRECTION: SOUTHBOUND
COUNT INTERVAL: 60 minutes
START TIME: 4:00 P.M.
END TIME: 4:00 A.M.

TIME	SUN	MON	TUES	WED	THUR	FRI	SAT	TOTAL	WKDY HRLY AVG
AM									
12-01	0	0	0	0	302	309	0	611	306
01-02	0	0	0	0	239	255	0	494	247
02-03	0	0	0	0	109	150	0	259	130
03-04	0	0	0	0	68	45	0	113	57
04-05	0	0	0	0	28	0	0	28	28
05-06	0	0	0	0	79	0	0	79	79
06-07	0	0	0	0	418	0	0	418	418
07-08	0	0	0	0	848	0	0	848	848
08-09	0	0	0	0	733	0	0	733	733
09-10	0	0	0	0	804	0	0	804	804
10-11	0	0	0	0	644	0	0	644	644
11-12N	0	0	0	0	748	0	0	748	748
PM									
12-01	0	0	0	0	700	0	0	700	700
01-02	0	0	0	0	716	0	0	716	716
02-03	0	0	0	0	677	0	0	677	677
03-04	0	0	0	0	748	0	0	748	748
04-05	0	0	0	697	900	0	0	1597	798
05-06	0	0	0	727	930	0	0	1657	829
06-07	0	0	0	780	632	0	0	1412	706
07-08	0	0	0	731	639	0	0	1370	685
08-09	0	0	0	586	509	0	0	1095	548
09-10	0	0	0	555	521	0	0	1076	538
10-11	0	0	0	487	584	0	0	1071	536
11-12M	0	0	0	358	419	0	0	777	389
TOTAL	0	0	0	4921	12995	759	0	18675	13097

AVERAGE WEEKDAY DAILY TRAFFIC: 13097 VEHICLES PER DAY (VPD)

AM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	MIDDAY PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	PM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
848	6 %	0	1117	9 %	0	748	6 %	0

AM PEAK HOUR: 7:00- 8:00 M'DAY PEAK HR: 15:00- 16:00PM PEAK HOUR: 16:00- 17:0

AVERAGE SATURDAY: 0 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0

SATURDAY PEAK HOUR: 11:00-12:00

AVERAGE SUNDAY: 0 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
0	0 %	0

SUNDAY PEAK HOUR: 11:00-12:00

MECHANICAL RECORDER COUNT SUMMARY

VANASSE HANGEN ASSOCIATES, INC.
TRANSPORTATION ENGINEERS & PLANNERS
184 HIGH STREET, BOSTON MA 02110
617-482-1870
CALCULATOR: PES JOB NO: 896

LOCATION: BLACKSTONE 200' E. SUDBURY
BOSTON, MASS.
DIRECTION: SOUTHBOUND ON SURFACE
COUNT INTERVAL: 60 minutes
START TIME: 12:00

DATE: 07/12 YEAR: 1984 (THURSDAY)

END TIME: 1:00 A.M. P.M.

TIME	SUN	MON	TUES	WED	THUR	FRI	SAT	TOTAL	WKDY HRLY AVG
AM									
12-01	349	134	0	0	0	259	388	1130	197
01-02	251	100	0	0	0	177	324	852	139
02-03	210	80	0	0	0	124	261	675	102
03-04	65	82	0	0	0	62	88	297	72
04-05	27	43	0	0	0	49	59	178	46
05-06	43	66	0	0	0	100	71	280	83
06-07	58	285	0	0	0	334	141	818	310
07-08	90	534	0	0	0	451	206	1281	493
08-09	142	618	0	0	0	411	326	1497	515
09-10	220	521	0	0	0	468	367	1576	495
10-11	283	509	0	0	0	528	352	1672	519
11-12N	417	579	0	0	0	657	377	2030	618
PM									
12-01	420	637	0	0	619	554	397	2627	603
01-02	399	0	0	0	596	569	393	1957	583
02-03	329	0	0	0	653	639	363	1984	646
03-04	0	0	0	0	724	771	350	1845	748
04-05	418	0	0	0	709	756	292	2175	733
05-06	628	0	0	0	680	563	238	2109	622
06-07	586	0	0	0	722	593	272	2173	658
07-08	519	0	0	0	668	557	315	2059	613
08-09	516	0	0	0	598	615	300	2029	607
09-10	400	0	0	0	559	547	549	2055	553
10-11	273	0	0	0	496	535	695	1999	516
11-12M	0	0	0	0	377	515	480	1372	446
TOTAL	6643	4188	0	0	7401	10834	7604	36670	10917

AVERAGE WEEKDAY DAILY TRAFFIC: 10917 VEHICLES PER DAY (VPD)

AM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	MIDDAY PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	PM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
618	6 %	0	771	7 %	0	756	7 %	0

AM PEAK HOUR: 8:00- 9:00 M'DAY PEAK HR: 15:00- 16:00PM PEAK HOUR: 16:00- 17:

AVERAGE SATURDAY: 317 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
695	6 %	0

SATURDAY PEAK HOUR: 10:00-11:00

AVERAGE SUNDAY: 277 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
628	6 %	0

SUNDAY PEAK HOUR: 5:00-6:00

MECHANICAL RECORDER COUNT SUMMARY

VANASSE HANGEN ASSOCIATES, INC.
TRANSPORTATION ENGINEERS & PLANNERS
184 HIGH STREET, BOSTON MA 02110
617-482-1870
CALCULATOR: PES JOB NO: 896
DATE: 07/12 YEAR: 1984 (THURSDAY)

LOCATION: BLACKSTONE 200' E. SUDBURY
BOSTON, MASS.
DIRECTION: SOUTHBOUND ON RAMP
COUNT INTERVAL: 60 minutes
START TIME: 12:00 A.M.
END TIME: 1:00 P.M.

TIME	SUN	MON	TUES	WED	THUR	FRI	SAT	TOTAL	WKDY HRLY AVG
AM									
12-01	209	103	0	0	0	138	293	743	121
01-02	174	66	0	0	0	96	226	562	81
02-03	159	63	0	0	0	89	162	473	76
03-04	63	26	0	0	0	39	92	220	33
04-05	31	16	0	0	0	28	58	133	22
05-06	38	51	0	0	0	98	71	258	75
06-07	68	380	0	0	0	478	144	1070	429
07-08	116	674	0	0	0	552	176	1518	613
08-09	147	624	0	0	0	304	229	1304	464
09-10	231	450	0	0	0	406	315	1402	428
10-11	248	444	0	0	0	398	339	1429	421
11-12N	319	529	0	0	0	434	242	1524	482
PM									
12-01	325	482	0	0	414	415	262	1898	437
01-02	295	0	0	0	493	400	268	1456	447
02-03	208	0	0	0	456	381	282	1327	419
03-04	0	0	0	0	671	433	228	1332	552
04-05	250	0	0	0	459	428	223	1360	444
05-06	250	0	0	0	269	307	234	1060	288
06-07	249	0	0	0	418	347	235	1249	383
07-08	282	0	0	0	439	394	190	1305	417
08-09	290	0	0	0	312	409	211	1222	361
09-10	251	0	0	0	450	376	301	1378	413
10-11	202	0	0	0	409	446	456	1513	428
11-12M	0	0	0	0	301	440	331	1072	371
TOTAL	4405	3908	0	0	5091	7836	5568	26808	8205

AVERAGE WEEKDAY DAILY TRAFFIC: 8205 VEHICLES PER DAY (VPD)

AM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	MIDDAY PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)	PM PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
674	8 %	0	671	8 %	0	459	6 %	0

AM PEAK HOUR: 7:00- 8:00 M'DAY PEAK HR: 15:00- 16:00PM PEAK HOUR: 16:00- 17:0

AVERAGE SATURDAY: 232 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
456	6 %	0

SATURDAY PEAK HOUR: 10:00-11:00

AVERAGE SUNDAY: 184 VPD

PEAK HOUR (VPH)	% OF ADT (%)	PEAK HOUR FACTOR (PHF)
325	4 %	0

SUNDAY PEAK HOUR: 12:00-1:00

Town: BOSTON, MA

Location: High Street (30' East of Batterymarch St.)

Direction: Westbound

Month 11 / Hour 1980	Sun. 16	Mon. 17	Tues.	Wed.	Thu. 13	Fri. 14	Sat. 15	Total
12 - 1A.M.	45	17				29	50	
1 - 2A.M.	34	9				20	29	
2 - 3A.M.	18	9				22	28	
3 - 4A.M.	4	8				14	16	
4 - 5A.M.	3	11				10	21	
5 - 6A.M.	9	49				43	15	
6 - 7A.M.	23	165				163	64	
7 - 8A.M.	38	397				380	162	
8 - 9A.M.	42	578				620	169	
9 - 10A.M.	45	474				473	174	
10 - 11A.M.	50	376				366	184	
11 - 12P.M.	99					389	192	
12 - 1P.M.	71					348	184	
1 - 2P.M.	89					339	173	
2 - 3P.M.	88				389	394	152	
3 - 4P.M.	108				306	311	163	
4 - 5P.M.	95				376	371	122	
5 - 6P.M.	55				305	281	91	
6 - 7P.M.	52				228	191	63	
7 - 8P.M.	42				120	147	76	
8 - 9P.M.	22				97	140	77	
9 - 10P.M.	28				69	137	73	
10 - 11P.M.	32				95	102	68	
11 - 12MID.	39				63	81	71	
TOTAL	1131	2093			2048	5371	2417	

Avg. Sat. 2417 Avg. Sun. 1131 Avg. Weekday 5371

MECHANICAL RECORDER COUNT RECORD VH #80-101

Town: BOSTON, MA

Location: Franklin St. (East of Oliver St.)

Direction: Westbound

Hour / Month 11 / 1980	Sun.	Mon. 10	Tues. 11*	Wed. 12	Thu. 13	Fri.	Sat.	Total
12 - 1A.M.			37	19	25			
1 - 2A.M.			43	30	18			
2 - 3A.M.			8	7				
3 - 4A.M.			6	2				
4 - 5A.M.			9	17				
5 - 6A.M.			9	23				
6 - 7A.M.			35	70				
7 - 8A.M.			116	237				
8 - 9A.M.			253	367				
9 - 10A.M.			217	354				
10 - 11A.M.			146	259				
11 - 12P.M.			174	223				
12 - 1P.M.			155	218				
1 - 2P.M.			201	210				
2 - 3P.M.			169	260				
3 - 4P.M.			142	246				
4 - 5P.M.		250	140	261				
5 - 6P.M.		124	81	187				
6 - 7P.M.		102	34	131				
7 - 8P.M.		92	54	95				
8 - 9P.M.		38	40	73				
9 - 10P.M.		47	31	62				
10 - 11P.M.		53	47	64				
11 - 12MID.		47	36	63				
TOTAL		753	2183	3478	43			

Avg. Sat. ________ Avg. Sun. ________ Avg. Weekday 3478

* VETERAN'S DAY

MECHANICAL RECORDER COUNT RECORD VH #30-101

Town: BOSTON

Location: Oliver St. (South of Franklin St.)

Direction: ~~Northbound~~

Month 11 / Hour 1980	Sun.	Mon. 10	Tues. 11*	Wed. 12	Thu. 13	Fri.	Sat.	Total
12 - 1A.M.			40	19	34			
1 - 2A.M.			14	11	15			
2 - 3A.M.			18	1				
3 - 4A.M.			12	10				
4 - 5A.M.			12	17				
5 - 6A.M.			17	74				
6 - 7A.M.			104	187				
7 - 8A.M.			235	275				
8 - 9A.M.			368	575				
9 - 10A.M.			199	411				
10 - 11A.M.			155	296				
11 - 12P.M.			175	279				
12 - 1P.M.			207	215				
1 - 2P.M.			197	239				
2 - 3P.M.			163	319				
3 - 4P.M.			139	301				
4 - 5P.M.		207	130	328				
5 - 6P.M.		201	102	204				
6 - 7P.M.		137	79	170				
7 - 8P.M.		99	44	138				
8 - 9P.M.		76	31	76				
9 - 10P.M.		101	22	80				
10 - 11P.M.		67	44	64				
11 - 12MID.		45	50	53				
TOTAL		933	2557	4342	49			

Avg. Sat. ______ Avg. Sun. ______ Avg. Weekday 4342

* VETERAN'S DAY

MECHANICAL RECORDER COUNT RECORD

Vanasse / Hangen Associates, Inc.
Transportation Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-0749

CALCULATED BY: GHA DATE: 4/24/82

CITY/TOWN: Boston STATE MA

LOCATION: Oliver St. North of the Parking Garage Entrance

DIR. Total JOB No. 0266-10 SHEET ___ OF ___

TIME \ MONTH April 1982	Sun.	Mon.	Tue. 20	Wed. 21	Thu. 22	Fri. 23	Sat.	TOTAL
12 - 1 A.M.				35	46	69		150
1 - 2 A.M.				12	15	52		79
2 - 3 A.M.				14	18	37		69
3 - 4 A.M.				6	9	11		25
4 - 5 A.M.				6	6	7		19
5 - 6 A.M.				28	39	39		106
6 - 7 A.M.				56	69	65		190
7 - 8 A.M.				89	75	94		258
8 - 9 A.M.				124	131	117		372
9 - 10 A.M.				153	179	169		501
10 - 11 A.M.				147	173	135		455
11 - 12 NOON				211	156	166		533
12 - 1 P.M.				153	168	201		522
1 - 2 P.M.				190	187			377
2 - 3 P.M.				219	171			390
3 - 4 P.M.			204	189	173			566
4 - 5 P.M.			256	219	232			707
5 - 6 P.M.			196	213	289			698
6 - 7 P.M.			154	144	156			454
7 - 8 P.M.			93	96	108			297
8 - 9 P.M.			82	75	93			250
9 - 10 P.M.			54	64	85			203
10 - 11 P.M.			48	67	129			244
11 - 12 MID.			43	46	82			171
TOTAL			1130	2556	2789	1162		7637

Avg. Sat. ________ Avg. Sun. ________ Avg. Weekday 2672

✓

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

BUREAU OF TRANSPORTATION PLANNING & DEVELOPMENT

VOLUME SUMMARY

CONDUCTED IN COOPERATION WITH FEDERAL HIGHWAY ADMINISTRATION

Year 1979 Station No. 8222 ~~- 2 Way~~ Traffic

Month December Route No. ______

or

Town Boston Street Northern Avenue Bridge; Over Fort Point Channel

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
Date				12-5-79	12-6-79	12-7-79		
2 - 1 A.M.					204	196		
1 - 2					94	86		
2 - 3					62	58		
3 - 4					52	63		
4 - 5					74	82		
5 - 6					239	226		
6 - 7					- 516	527		
7 - 8				*	1,217	1,223		
8 - 9				~~7[illegible]~~	1,336	1,348		
9 - 10				~~9[illegible]6~~	1,004	1,016		
0 - 11				~~[illegible]1~~	911	910		
1 - 12				~~[illegible]6~~	934	967		
2 P.M.				~~1,1[illegible]3~~	1,144	1,169		
1 - 2				~~1,161~~	1,151	1,217		
2 - 3				1,237	1,189			
3 - 4				1,339	1,296			
4 - 5				1,806	1,782			
5 - 6				1,446	1,515			
6 - 7				1,126	1,161			
7 - 8				967	1,023			
8 - 9				821	782			
9 - 10				638	557			
0 - 11				536	510			
1 - 12				511	- 434	-	-	-
Total				~~5,6[illegible]2~~ *	9,[illegible]46 *	9,112 *		43,900 *
				10 477				
Average ek Day								38825

19413

1.00

19410

Day	Weather	Road Conditions	Temperature
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			

TPD-841 REV. 9-11-70

DIVERSIFIED ENGINEERING SERVICES
19 WINTHROP ROAD • BROOKLINE, MASSACHUSETTS 02146

AUTOMATIC TRAFFIC COUNTER SUMMARY

LOCATION: SUMMER STREET BRIDGE (FORT POINT CH.) OUTBOUND LOCATION 18
BOSTON CORDON COUNT

YEAR 1982 MONTH SEPT. DAYS

Hour Beginning / Month	Sun.	Mon. 9/20	Tue. 9/21	Wed. 9/22	Thu.	Fri.	Sat.	Total
12 - 1 A.M.			89	122				
1 - 2 A.M.			60	107				
2 - 3 A.M.			50	72				
3 - 4 A.M.			76	49				
4 - 5 A.M.			161	191				
5 - 6 A.M.			816	835				
6 - 7 A.M.		1002	1418	1423				
7 - 8 A.M.		1028		1286				
8 - 9 A.M.		880	995	990				
9 - 10 A.M.		877	1393	910				
10 - 11 A.M.		823	1014	841				
11 - 12 Noon		728	894	852				
12 - 1 P.M.		793	976	875				
1 - 2 P.M.		836	1009	879				
2 - 3 P.M.		1014	1022	1297				
3 - 4 P.M.		1066	998	1131				
4 - 5 P.M.		1103	965	1288				
5 - 6 P.M.		716	743	750				
6 - 7 P.M.		428	482	422				
7 - 8 P.M.		358	403	349				
8 - 9 P.M.		336	389	361				
9 - 10 P.M.		360	344	388				
10 - 11 P.M.		194	251	287				
11 - 12 Mid.		184	174	200				
TOTALS			(15,677)	15,922				

Avg Day = 16,008

DIVERSIFIED ENGINEERING SERVICES

19 WINTHROP ROAD • BROOKLINE, MASSACHUSETTS 02146

AUTOMATIC TRAFFIC COUNTER SUMMARY

LOCATION: SUMMER STREET BRIDGE (FORT POINT CH.) INBOUND LOCATION 19

BOSTON CORDON COUNT

YEAR 1982 MONTH SEPT DAYS

Hour Beginning \ Month	Sun.	Mon. 9/20	Tue. 9/21	Wed. 9/22	Thu.	Fri.	Sat.	Total
12 - 1 A.M.			57	209				
1 - 2 A.M.			74	115				
2 - 3 A.M.			47	124				
3 - 4 A.M.			57	89				
4 - 5 A.M.			64	105				
5 - 6 A.M.			54	64				
6 - 7 A.M.		616	516	552				
7 - 8 A.M.		927	999	1186				
8 - 9 A.M.		1153	986	1313				
9 - 10 A.M.		786	748	1293				
10 - 11 A.M.		768	761	914				
11 - 12 Noon		771	1001	719				
12 - 1 P.M.		873	948	522				
1 - 2 P.M.		890	1025	735				
2 - 3 P.M.		769	933	879				
3 - 4 P.M.		983	1148	1015				
4 - 5 P.M.			1118	1192				
5 - 6 P.M.			830					
6 - 7 P.M.			733					
7 - 8 P.M.			511					
8 - 9 P.M.		375	419					
9 - 10 P.M.		342	318					
10 - 11 P.M.		323	323					
11 - 12 Mid.		312	352					
TOTALS			(14,000)	(14,500)				

Avg. Day = 14,132

TOTAL: 16,008
+14,132
28,140

VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923
LOCATION: ____ SHEET ____ OF ____
CALCULATED BY: BG DATE: ____
CHECKED BY: ____ DATE: ____
TITLE: Mechanical Recorder Counts

Location	Year	ADT
Atlantic Ave.		
at Northern Ave.	1981	17,040 [2]
at Northern Ave.	1982	14,650 [4]
South of Congress St.	1982	10,600 [4]
North of Northern Ave.	1982	21,500 [4]
Blackstone St.		
East of Sudbury St.	1982	3750 [4]
East of New Chardon St.	1982	7250 [4]
Clinton St.		
Congress St.		
East of Milk St.	1980	9460 [1]
East of Franklin St.	1980	12,050 [1]
East of Atlantic Ave.	1981	10,090 [2]
East of Atlantic Ave. (EB)	1982	8800 [4]
East of Atlantic Ave. (WB)	1982	8500 [4]

[1] Traffic study for a proposed Mutli-Office Building by VHA dated Jan., 81.
[2] Comm Pier Five EIR by VHA dated July, 82.
[3] Building 114 Renovation EIR by VHA dated Dec., 82.
[4] Third Harbor Tunnel EIR dated Dec., 82.

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JOB International Place JOB No. 0923
LOCATION ______ SHEET ___ OF ___
CALCULATED BY BG DATE ______
CHECKED BY ______ DATE ______
TITLE Mechanical Recorder Counts

Location	Year	ADT
DORCHESTER AVE.		
FRANKLIN ST.		
East of Oliver St.	1980	3430[1]
East of Pearl St.	1980	4390[1]
At Pearl St.	1980	3690[1]
HIGH ST.		
East of Pearl St.	1980	11,120[4]
East of Congress St.	1980	7,250[4]
East of Batterymarch St.	1980	5[illegible]0[1]
MILK ST.		
East of Broad St.	1980	3420[4]
East of Congress St.	1980	1790[4]
NORTH ST.		
EAST OF UNION ST. (EB)	1982	9200[4]
EAST OF UNION ST. (WB)	1982	7300[1]

1) Traffic study for a proposed Mutli-Office Building by VHA dated Jan., 81.
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4) Third Harbor Tunnel EIR dated Dec., 82.

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JOB: International Place JOB No. 0923
LOCATION: SHEET OF
CALCULATED BY: BG DATE:
CHECKED BY: DATE:
TITLE: Mechanical Recorder Counts

Location	Year	ADT
NORTHERN AVE.		
NORTHERN AVE. BRIDGE	1981	20,560 [1,2]
EAST OF ATLANTIC AVE. (EB)	1982	8250 [4]
EAST OF ATLANTIC AVE. (WB)	1982	9800 [4]
OLIVER ST.		
SOUTH OF FRANKLIN ST.	1980	4340 [1]
PEARL ST.		
SOUTH OF MILK ST.	1980	5660 [1]
SOUTH OF FRANKLIN ST.	1980	4740 [1]
PURCHASE ST.		
STATE ST.		
EAST OF NEW CONGRESS ST.	1982	16,000 [4]
EAST OF CENTRAL ARTERY	1982	5100 [4]

1) Traffic study for a proposed Mutli-Office Building by VHA dated Jan., 81.
2) Commpier Five EIR by VHA dated July, 82.
3) Building 114 Renovation EIR by VHA dated Dec., 82.
4) Third Harbor Tunnel EIR dated Dec., 82.

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JOB: International Place JOB No. 0923
LOCATION: SHEET OF
CALCULATED BY: BG DATE:
CHECKED BY: DATE:
TITLE: Mechanical Recorder Counts

Location	Year	ADT
SUMMER ST.		
AT FORT POINT CHANNEL	1981	28,290 [2]
AT FORT POINT CHANNEL	1982	28,140 [3]
EAST OF ATLANTIC AVE. (EB)	1982	10,300 [4]
EAST OF ATLANTIC AVE (WB)	1982	10,000 [4]
SURFACE ARTERY		
NORTH OF STATE ST. (SB)	1982	15,750 [4]
SOUTH OF STATE ST (NB)	1982	14,550 [4]
OFF-RAMP AT HIGH ST		
	1981	10,020 [1]
	1982	12,000 [4]
OFF-RAMP AT NORTHERN AVE AND ATLANTIC		
	1981	8,230 [2]

[1] Traffic study for a proposed Multi-Office Building by VHA dated Jan., 81.
[2] Commpier Five EIR by VHA dated July, 82.
[3] Building 114 Renovation EIR by VHA dated Dec., 82.
[4] Third Harbor Tunnel EIR dated Dec., 82.

LEVEL OF SERVICE ANALYSES

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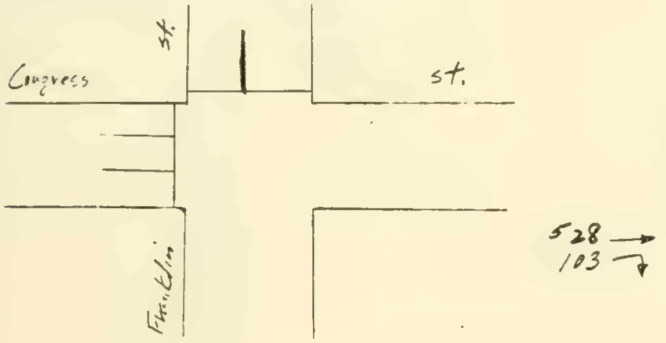
INTERSECTION CONGRESS ST. / FRANKLIN ST.
ALT. EXISTING YEAR ____ PERIOD AM
CALCULATED BY BG DATE 4-11-84 SHEET ___ OF ___
CHECKED BY WDS DATE ____ JOB NO. 0788

INTERSECTION GEOMETRY



Indicate North

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING (2ϕ)

A	B	C	D	E
316 315 212 103	185 184 137			
CLV= 316	CLV= 185	CLV=	CLV=	CLV=

Σ CLV 501 ~~Alt = 626~~
V/C 0.42
LOS A
20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ϕ	3 ϕ	4 ϕ
LOS	A	750	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	~~1500~~	1425	1375

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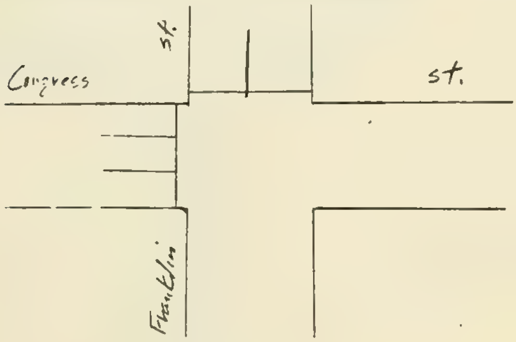
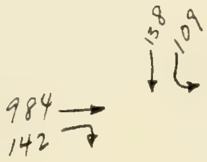
INTERSECTION CONGRESS ST. / FRANKLIN ST.
ALT. EXISTING YEAR ______ PERIOD PM
CALCULATED BY BG DATE 4-11-84 SHEET ___ OF ___
CHECKED BY WDS DATE ______ JOB NO. 0788

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ø

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
563, 421, 142	124, 123, 109			
CLV= 563	CLV= 124	CLV=	CLV=	CLV=

Σ CLV 687 Adj ✓ 859
V/C 0.57
LOS A
20% Reduction for Peds

CRITERIA (vph)		AP'1	2 ø	3 ø	4 ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1050	1350	1275	1225
	E	1200	~~1500~~	1425	1375

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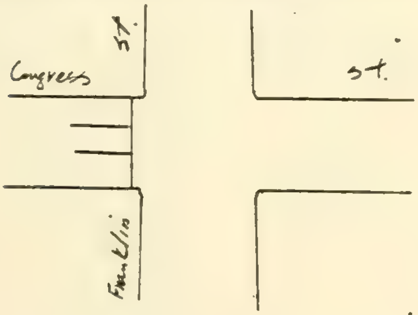
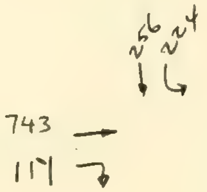
INTERSECTION Congress St. / Franklin St.
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY KB DATE 7/13 JOB NO. 0423

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø

A	B	C	D	E
427 → 427 ↘ 111	24? 240 ↓ ↓ 224			
CLV= 427	CLV= 240	CLV=	CLV=	CLV=

Σ CLV 667 ADJ (834)
V/C 0.56
LOS A

20% Reduction for Peds

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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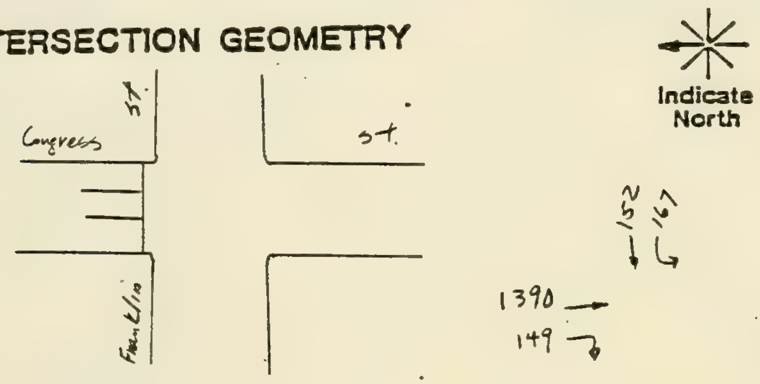
INTERSECTION Congress St. / Franklin St.
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE 8/13 JOB NO. 0723

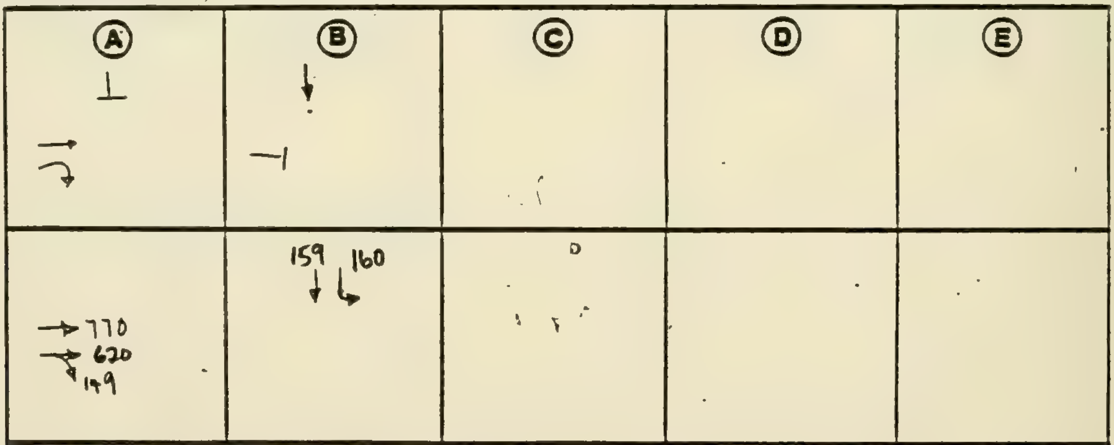
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2∅



A	B	C	D	E
CLV= 770	CLV= 160	CLV=	CLV=	CLV=

Σ CLV 930 (ADJ (1163))
V/C 0.78
LOS C

20% Reduction for Peds

CRITERIA (vph)		ADT	2 ∅	3 ∅	4 ∅
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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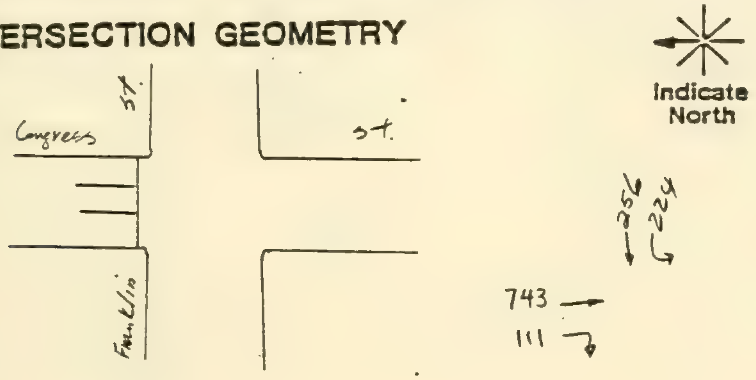
INTERSECTION CONGRESS ST. / FRANKLIN ST.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY BG/GD DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 8/13/84 JOB NO. 0723

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ø

A	B	C	D	E
427 → 427 111	240 240 ramp			
CLV= 427	CLV= 240	CLV=	CLV=	CLV=

Σ CLV 667 (AOJ 833)
V/C 0.56
LOS A
20% Reduction for Peds

CRITERIA (vph)		[illegible]	2 ø	3 ø	4 ø
LOS	A	730	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1050	1350	1275	1225
	E	1300	1500	1425	1375

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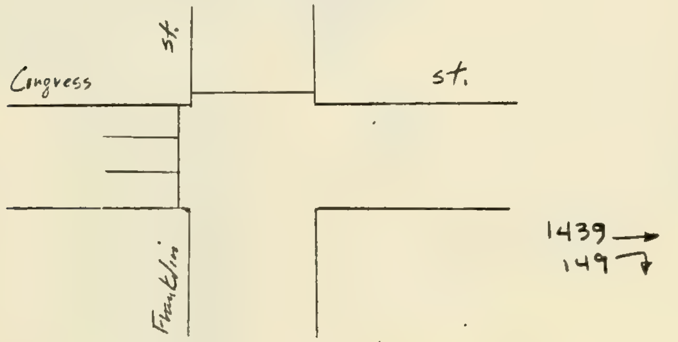
INTERSECTION CONGRESS ST. / FRANKLIN ST.
ALT. BUILD YEAR 1990 PERIOD PM
CALCULATED BY DSD DATE 9/30/84 SHEET ___ OF ___
CHECKED BY RB DATE 2/13 JOB NO. 0788/923

INTERSECTION GEOMETRY



Indicate North

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ø

A	B	C	D	E
794 → 794 → 149	160 159			
CLV= 794	CLV= 160	CLV=	CLV=	CLV=

Σ CLV 954 (1193) ADJ
V/C 0.79
LOS C
20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ø	3 ø	4 ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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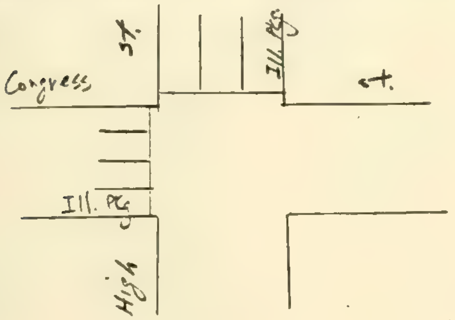
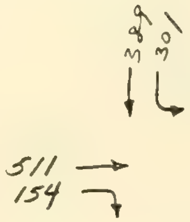
INTERSECTION CONGRESS ST / HIGH ST
ALT. EXISTING YEAR 1984 PERIOD AM
CALCULATED BY BG DATE 4-10-84 SHEET OF
CHECKED BY RB DATE 8/10/84 JOB NO. 0788

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2∅

(A)	(B)	(C)	(D)	(E)
222 222 154	389 301			
CLV= 222	CLV= 389	CLV=	CLV=	CLV=

Σ CLV 611 (ADJ 719)
V/C 0.48
LOS A
15 % Reduction for Peds

CRITERIA (vph)		ADJ	2 ∅	3 ∅	4 ∅
LOS	A	765	900	855	825
	B	893	1050	1000	965
	C	1020	1200	1140	1100
	D	1148	1350	1275	1225
	E	1275	1500	1425	1375

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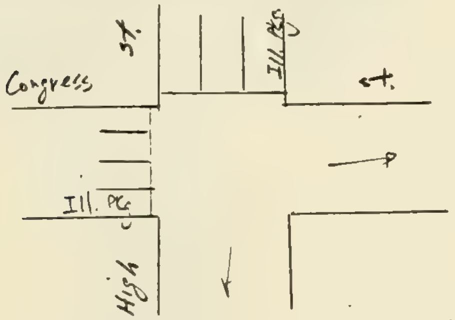
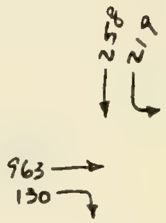
INTERSECTION CONGRESS ST / HIGH ST
ALT. EXISTING YEAR 1984 PERIOD PM
CALCULATED BY BG DATE 4-11-84 SHEET ___ OF ___
CHECKED BY WJS DATE ______ JOB NO. 0788

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø

(A)	(B)	(C)	(D)	(E)
364 365 364 130	258 219	OPTIONAL	CONSERVATIVE	
CLV= 365	CLV= 258	CLV=	CLV=	CLV=

Σ CLV 623 (AOS 733)
V/C 0.49
LOS A
15% Reduction for Peds

CRITERIA (vph)		AOS	2 Ø	3 Ø	4 Ø
LOS	A	765	900	855	825
	B	893	1050	1000	965
	C	1020	1200	1140	1100
	D	1148	1350	1275	1225
	E	1275	1500	1425	1375

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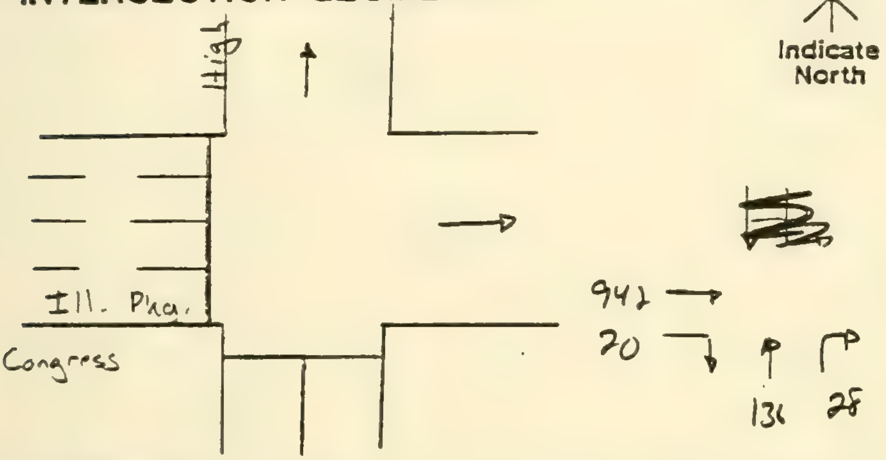
INTERSECTION Congress St / High St
ALT. No Build YEAR 1990 PERIOD AM
CALCULATED BY ______ DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 10/89 JOB NO. 738

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2φ

(A)	(B)	(C)	(D)	(E)
321 321 320 20	82 82			
CLV= 321	CLV= 82	CLV=	CLV=	CLV=

Σ CLV 403
V/C 0.32
LOS A

ADJ. CLV.

CRITERIA (vph)		ADJ	2 ø	3 ø	4 ø
LOS	A	765	900	855	825
	B	893	1050	1000	965
	C	1020	1200	1140	1100
	D	1148	1350	1275	1225
	E	1275	1500	1425	1375

15 % Reduction for Peds

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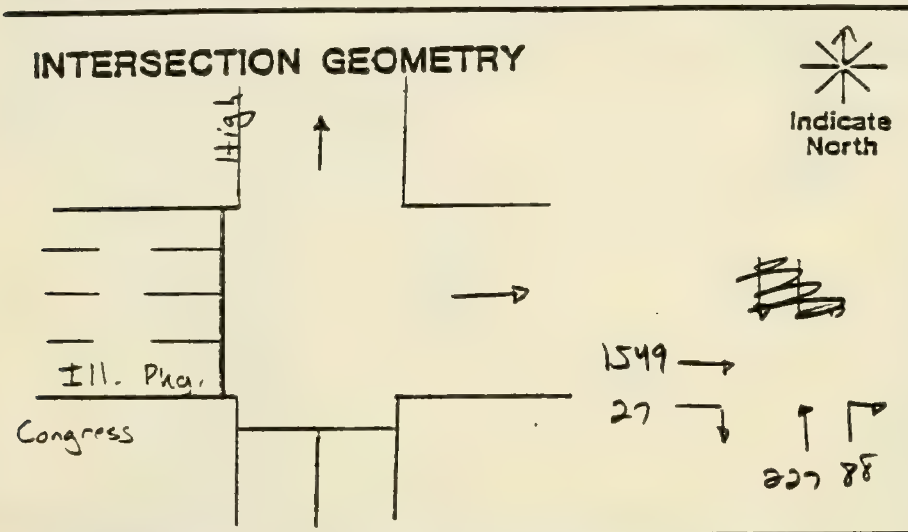
INTERSECTION Congress St / High St
ALT. No Build YEAR 1990 PERIOD pm
CALCULATED BY ______ DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 10/29 JOB NO. 778

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2 ϕ

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
525 521 525 27	158 157			
CLV= 526	CLV= 158	CLV=	CLV=	CLV=

Σ CLV 684
V/C .54
LOS A

ADJ. CLV.

CRITERIA (vph)		ADJ	2 ϕ	3 ϕ	4 ϕ
LOS	A	765	900	855	825
	B	893	1050	1000	965
	C	1020	1200	1140	1100
	D	1148	1350	1275	1225
	E	1275	1500	1425	1375

15 % Reduction for Peds.

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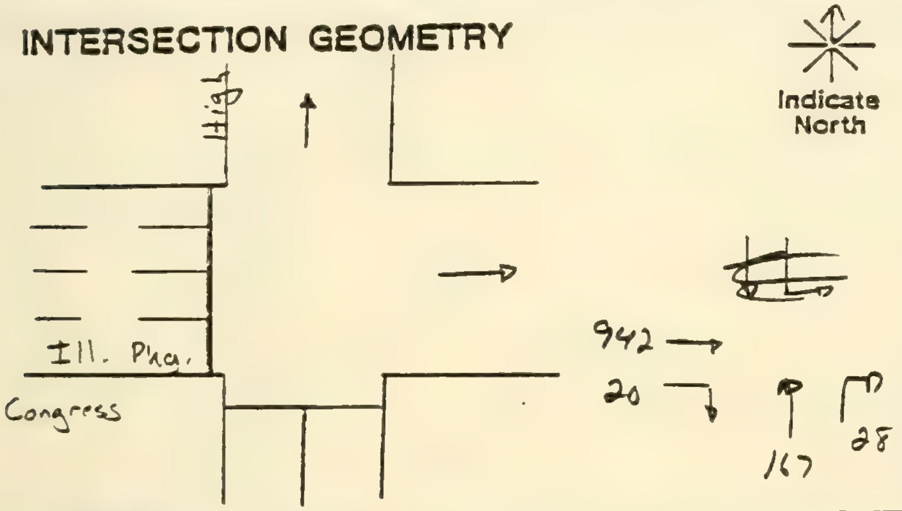
INTERSECTION Congress St / High St
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY ______ DATE ______ SHEET ___ OF ___
CHECKED BY RR DATE 10/29 JOB NO. 778

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2 ϕ

A	B	C	D	E
321 321 321 20	98 97 25			
CLV= 321	CLV= 98	CLV=	CLV=	CLV=

Σ CLV 419
V/C .33
LOS A

ADJ. CLV.

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	765	900	855	825
	B	893	1050	1000	965
	C	1020	1200	1140	1100
	D	1148	1350	1275	1225
	E	1275	1500	1425	1375

15 % Reduction for Peds.

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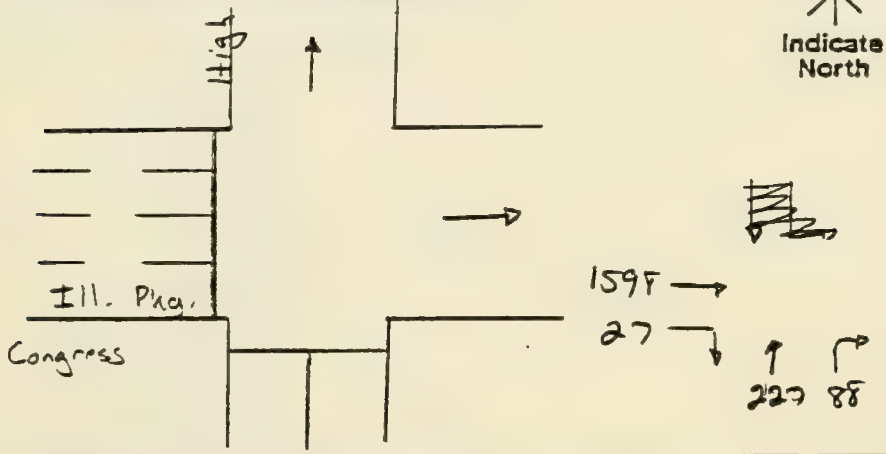
INTERSECTION Congress St / High St
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY ____ DATE ____ SHEET ____ OF ____
CHECKED BY RB DATE 10/29 JOB NO. 778

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2 φ

A	B	C	D	E
541 → 542 → 542 → 27	158 157			
CLV= 542	CLV= 158	CLV=	CLV=	CLV=

Σ CLV 700 ADJ. CLV.
V/C .55
LOS A

15 % Reduction for Peds.

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	765	900	855	825
	B	893	1050	1000	965
	C	1020	1200	1140	1100
	D	1148	1350	1275	1225
	E	1275	1500	1425	1375

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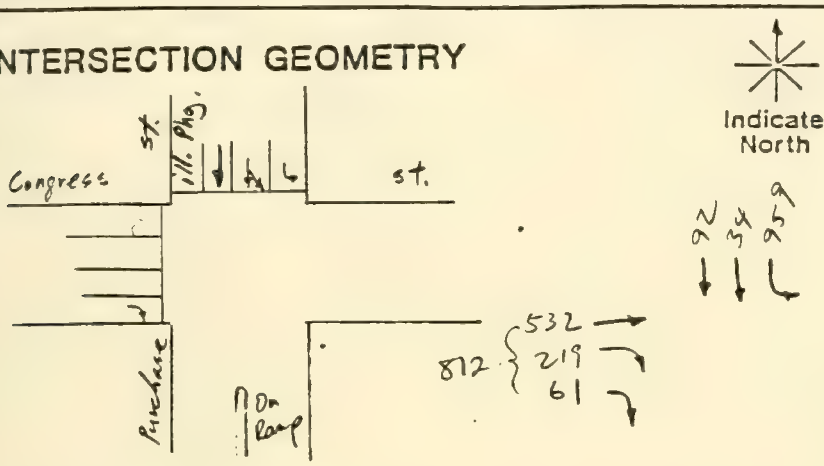
INTERSECTION CONGRESS ST. / PURCHASE ST.
ALT. EXISTING YEAR ____ PERIOD AM
CALCULATED BY EG DATE 4-10-86 SHEET ___ OF ___
CHECKED BY RB DATE ____ JOB NO. 0788

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING ~~3ø~~ 2ø w/Advance

A	B	C	D	E
431 528				LT ADV = 16 sec/90 sec Cycle ≈ 18%
213 260	92 34 268	270 271 271		Assume 3 sec startup and 2 sec/veh = 13 sec or 6.5 veh/cycle; 40 cycles/hr = 260 vph
CLV= 260	CLV= 268	CLV= 271	CLV=	CLV=

Use 2ø criteria

ΣCLV 791 ADJ. 1130
V/C .75
LOS C
30% Reduction for Peds

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	630	900	855	825
	B	735	1050	1000	965
	C	840	1200	1140	1100
	D	945	1350	1275	1225
	E	1050	1500	1425	1375

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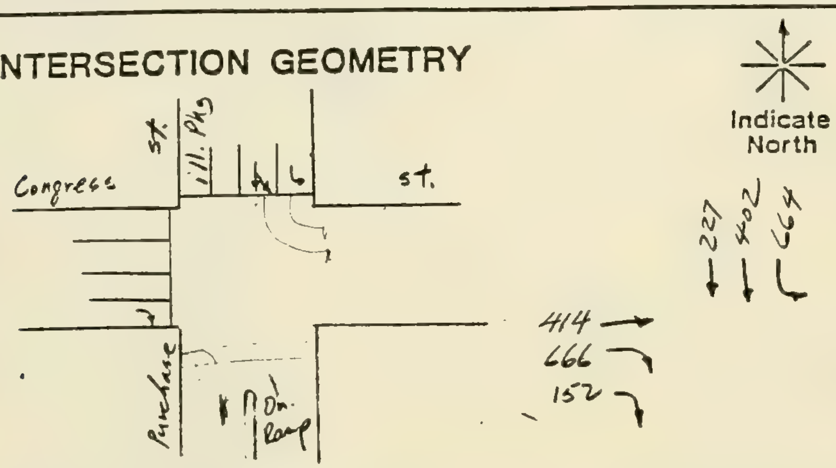
INTERSECTION CONGRESS ST. / PURCHASE ST.
ALT. EXISTING YEAR ____ PERIOD PM
CALCULATED BY BG DATE 4-10-84 SHEET ____ OF ____
CHECKED BY RD DATE 4/10 JOB NO. 0788

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING

2 ∅ Advance

A	B	C	D	E
260 vph MAX based on timing				
130 260 CARRY OVER = 664 - 390 = 274	315 315 274 227 88 0	410 411 4 411 407 259 152		
CLV= 260	CLV= 315	CLV= 411	CLV=	CLV=

MIXED FLOW IN LT Lane - comps only 1/2 of inside lane

PED ADJ.

Σ CLV 986 1409

V/C 0.94

LOS E

30% Reduction for Peds

CRITERIA (vph)		ADJ	2 ∅	3 ∅	4 ∅
LOS	A	630	900	855	825
	B	735	1050	1000	965
	C	840	1200	1140	1100
	D	945	1350	1275	1225
	E	1050	1500	1425	1375

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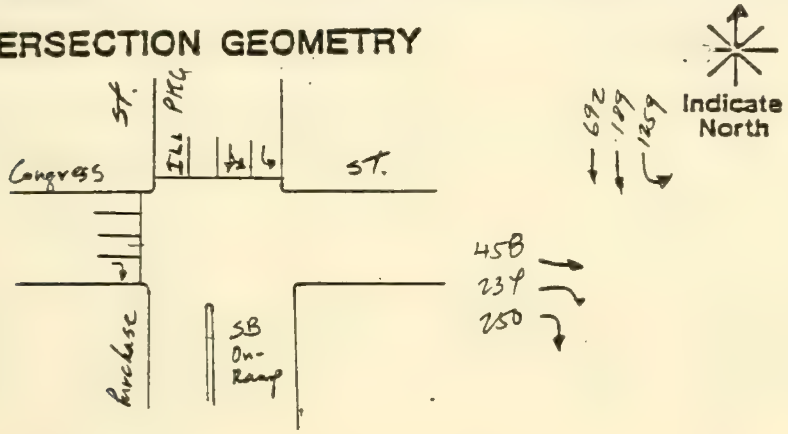
INTERSECTION CONGRESS ST. / PURCHASE ST.
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 7/13 JOB NO. 0723

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING ~~3ϕ~~ 2ϕ w/ ADV

A	B	C	D	E
ADV 260 MAX based on timing	(786 + 189 + 692) ÷ 3			
213 260 1259 - 473 = 786	556 556 555	314 314 314 170		
CLV= 260	CLV= 556	CLV= 314	CLV=	CLV=

Use 2ϕ criteria

Σ CLV 1130 PED ADJ (1413)
V/C 0.94
LOS E
20% Reduction for Peds

CRITERIA (vph)		ADV	2 ϕ	3 ϕ	4 ϕ
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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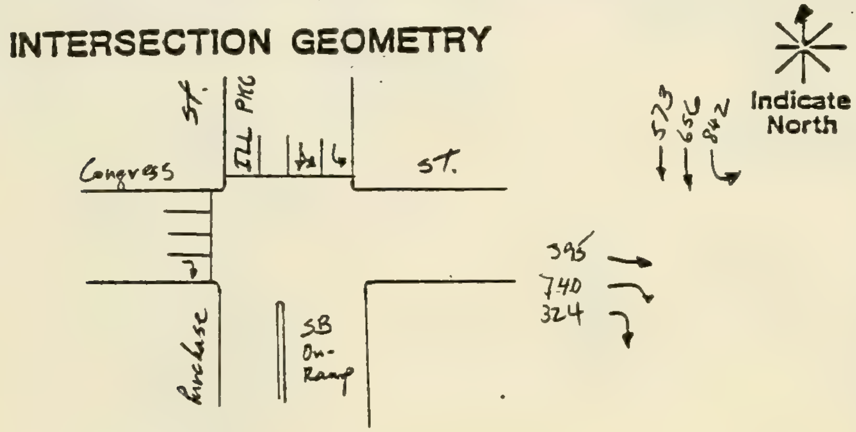
INTERSECTION CONGRESS ST. / PURCHASE ST.
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY PR DATE 4/13 JOB NO. 0723

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING ~~3ø~~ 2ø w/ Adv.

A	B	C	D	E
	1681/3 =			
130 260 842 - 390 = 452	614 615, 452	395 532 532		
CLV= 260	CLV= 615	CLV= 532	CLV=	CLV=

Use 2ø criteria

Σ CLV 1407 ADJ 1259
V/C 1.17
LOS E
20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ø	3 ø	4 ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1050	1350	1275	1225
	E	1200	1500	1425	1375

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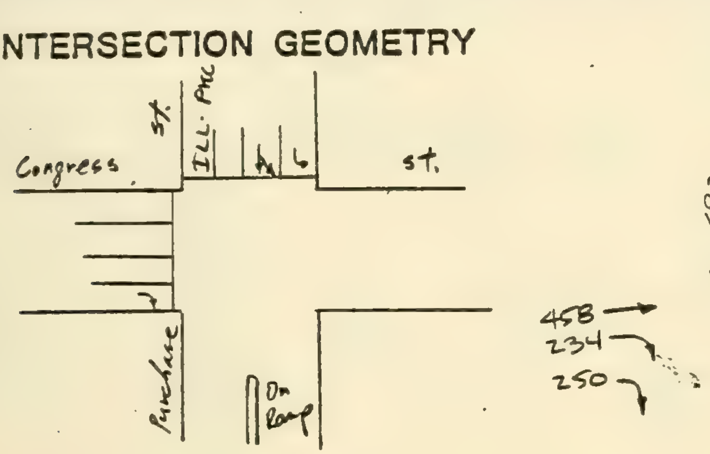
INTERSECTION CONGRESS ST. / PURCHASE ST.
ALT. BUILD YEAR 1990 PERIOD AM
CALCULATED BY DJD DATE 4/26/84 SHEET OF
CHECKED BY RB DATE 8NB JOB NO. 0788/923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2∅ W/LEAD

A	B	C	D	E
	794 + 189 + 692 = 1675/3			
213 260 1267 - 473 = 794	558 558 558 5 611	314 314 314 170		
CLV= 860	CLV= 558	CLV= 314	CLV=	CLV=

Use 2∅ Criteria

ADJ

Σ CLV 1132 1415
V/C .94
LOS E
20% Reduction for Peds

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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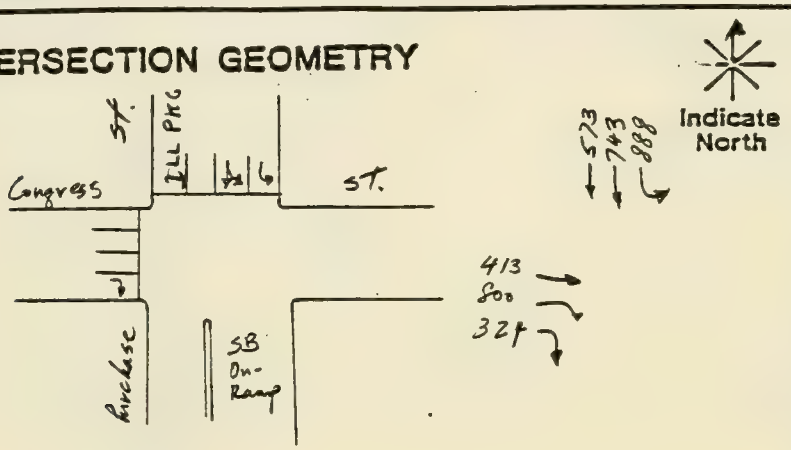
INTERSECTION Congress St. / Purchase St.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY DJD DATE SHEET OF
CHECKED BY BGT DATE 8/11/84 JOB NO. 0733

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3φ

A	B	C	D	E
130 260 888 - 390 = 498	658 658 498	413 562 562		
CLV= 260	CLV= 658	CLV= 562	CLV=	CLV=

Σ CLV 1480 (1850) ADJ
V/C 1.23
LOS E
20% reduction for Peds

CRITERIA (vph)		2 Ø	ADJ	3 Ø	4 Ø
LOS	A	900	684	855	825
	B	1050	800	1000	965
	C	1200	912	1140	1100
	D	1350	1020	1275	1225
	E	1500	1140	1425	1375

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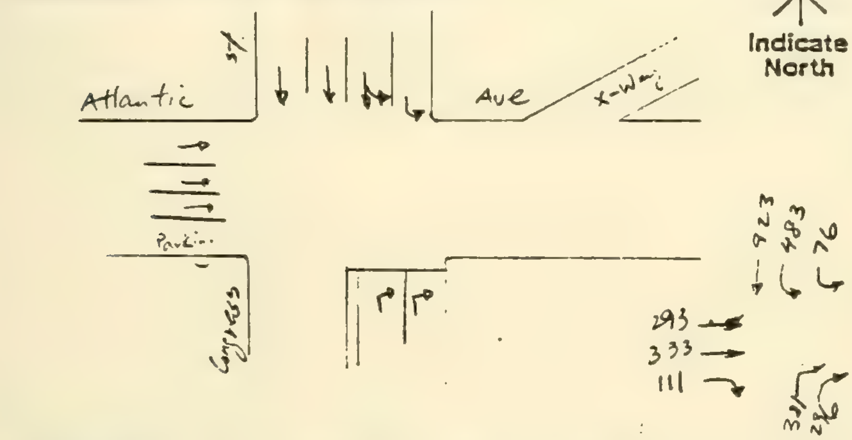
INTERSECTION ATLANTIC AVE. / CONGRESS ST.
ALT. Existing YEAR ____ PERIOD AM
CALCULATED BY DJK DATE ____ SHEET ___ OF ___
CHECKED BY BW DATE 8/13/84 JOB NO. 0523

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3Ø

(A)	(B)	(C)	(D)	(E)
	Carryover = 923-676 = 247			
338 338 / 338 338*	123 124 52 307	246 246 246		
CLV= 338	CLV= 307	CLV= 246	CLV=	CLV=

* USE 50/50 split since ramp vol. > RT volume

ADJ

Σ CLV 891* 1048

V/C 0.74

LOS C

15% Reduction for Peds

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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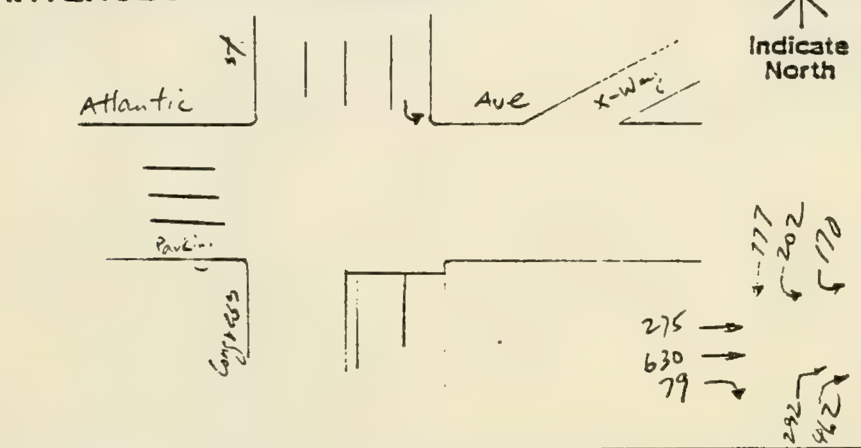
INTERSECTION ATLANTIC AVE. / CONGRESS ST.
ALT. Existing YEAR ____ PERIOD PM
CALCULATED BY DJK DATE ____ SHEET ___ OF ___
CHECKED BY BG DATE 8/13/84 JOB NO. 0523

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3 ø

A	B	C	D	E
314				
389 388 339 415	99 167 205	324 324 328		
CLV= 415	CLV= 205	CLV= 328	CLV=	CLV=

Σ CLV 948 ADJ 1115
V/C 0.78
LOS C

15% Reduction for Peds

CRITERIA (vph)		2 ø	ADJ	3 ø	4 ø
LOS	A	900	727	855	825
	B	1050	850	1000	965
	C	1200	969	1140	1100
	D	1350	1084	1275	1225
	E	1500	1211	1425	1375

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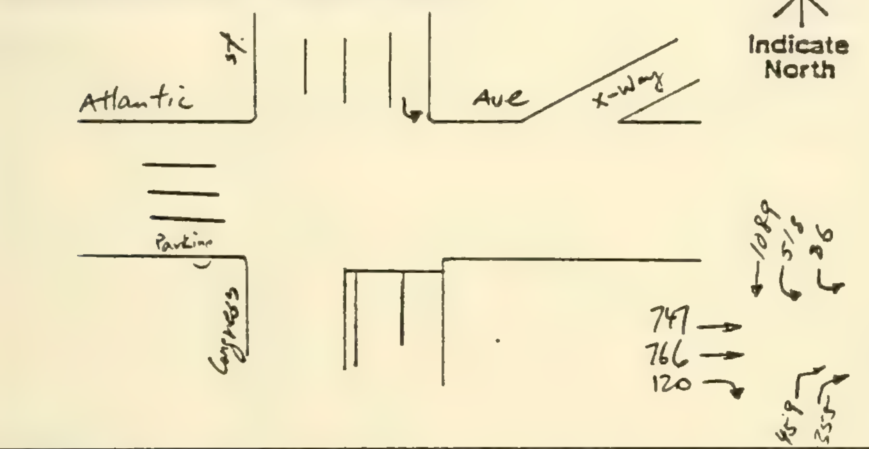
INTERSECTION ATLANTIC AVE. / CONGRESS ST.
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ____ SHEET ____ OF ____
CHECKED BY AB DATE 8/13 JOB NO. 0523

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3ø

A	B	C	D	E
1089-814 = 275 carryover				
407 407 40 40 *	137 138 378 332	544 544 544		
CLV= 407	CLV= 332	CLV= 544	CLV=	CLV=

* 50/50 split OK as Ramp Vol > RT Vol.

Σ CLV 1283 ADJ 1509
V/C 1.06
LOS E

15% Reduction for Peds

CRITERIA (vph)		2 ø	ADJ	3 ø	4 ø
LOS	A	900	737	855	825
	B	1050	852	1000	965
	C	1200	969	1140	1100
	D	1350	1084	1275	1225
	E	1500	1211	1425	1375

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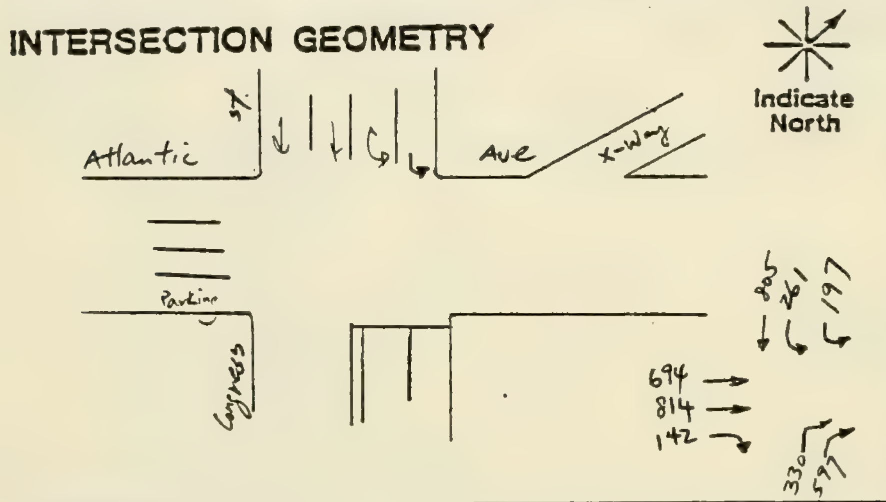
INTERSECTION ATLANTIC AVE. / CONGRESS ST.
ALT. No Build YEAR 1996 PERIOD PM
CALCULATED BY BGT DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 7/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3Ø

A	B	C	D	E
402 403 417 510	206 252	550 550 550		
CLV= 510	CLV= 252	CLV= 550	CLV=	CLV=

Σ CLV 1312 ADJ 1544
V/C 1.08
LOS E

15% Reduction for Peds

CRITERIA (vph)		2 Ø	ADJ	3 Ø	4 Ø
LOS	A	900	727	855	825
	B	1050	850	1000	965
	C	1200	969	1140	1100
	D	1350	1084	1275	1225
	E	1500	1211	1425	1375

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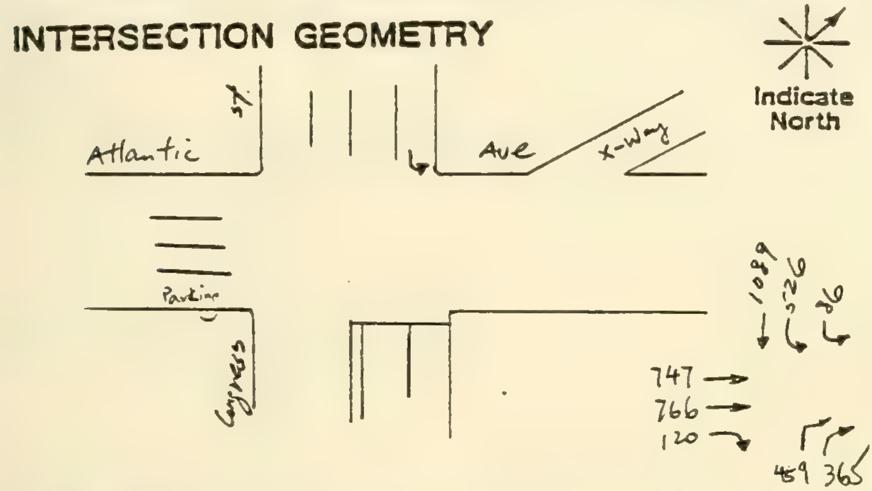
INTERSECTION ATLANTIC AVE. / CONGRESS ST.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE 8/11/84 SHEET ___ OF ___
CHECKED BY RE DATE 8/14/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3φ

A	B	C	D	E
412 412 / 412 412 *	132 132 225 337	544 / 544 / 544 / 120		
CLV= 412	CLV= 337	CLV= 544	CLV=	CLV=

SB/SB split OK as Ramp vol > RT vol.

Σ CLV 1293 ADJ 1521

V/C 1.07

LOS E

15% Reduction for Peds

CRITERIA (vph)		2 φ	ADJ	3 φ	4 φ
LOS	A	900	737	855	825
	B	1050	850	1000	965
	C	1200	969	1140	1100
	D	1350	1054	1275	1225
	E	1500	1211	1425	1375

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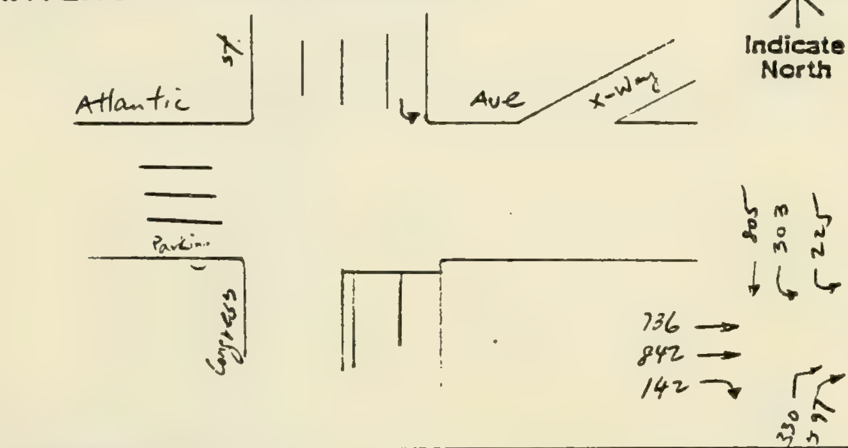
INTERSECTION ATLANTIC AVE. / CONGRESS ST.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY DJD DATE SHEET OF
CHECKED BY BGT DATE 8/11/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3ø

A	B	C	D	E
407 403 417 510	235 290	574 513 142		
CLV= 510	CLV= 290	CLV= 574	CLV=	CLV=

Σ CLV 1374

V/C 1.13

LOS E

ADT
1616

15% Reduction for Peds

CRITERIA (vph)		2 ø	85	3 ø	4 ø
LOS	A	900	727	855	825
	B	1050	850	1000	965
	C	1200	969	1140	1100
	D	1350	1084	1275	1225
	E	1500	1211	1425	1375

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA
CONGRESS ST./DORCHESTER AVE.
EXIST AM - LT OUT FROM DORCHESTER AVE.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
    VOLUME.................................. 1089 VPH
    ARRIVAL RATE............................ .303 VPS
ANALYSIS MOVEMENT TRAFFIC
    VOLUME.................................. 295 VPH
    ARRIVAL RATE............................ .082 VPS

RESULTS

CAPACITY= 402 VPH

RESERVE CAPACITY= 107 VPH

ACCEPTABLE GAPS
    PERCENT OF ALL GAPS..................... 22 PERCENT
    AVERAGE LENGTH.......................... 8.3 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
    TO ALL VEHICLES......................... .6 SECONDS
    TO DELAYED VEHICLES ONLY................ 3.9 SECONDS

AVERAGE WAIT IN A QUEUE
    TO ALL VEHICLES......................... 24.6 SECONDS
    TO QUEUED VEHICLES ONLY................. 33.5 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
    TO ALL VEHICLES......................... 25.2 SECONDS
    TO DELAYED AND QUEUED VEHICLES ONLY..... 37.5 SECONDS

QUEUE LENGTH
    AVERAGE................................. 2.7 VEHICLES
    95TH PERCENTILE......................... 5.4 VEHICLES

LEVEL OF SERVICE --- D ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA
CONGRESS ST./DORCHESTER AVE.
EXISTING PM - LT OUT FROM DORCHESTER AVE.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME....................................... 958 VPH
ARRIVAL RATE................................. .266 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME....................................... 459 VPH
ARRIVAL RATE................................. .128 VPS

RESULTS

CAPACITY= 460 VPH

RESERVE CAPACITY= 1 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS.......................... 26.4 PERCENT
AVERAGE LENGTH............................... 8.8 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES.............................. .5 SECONDS
TO DELAYED VEHICLES ONLY..................... 3.8 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES.............................. 2422.7 SECONDS
TO QUEUED VEHICLES ONLY...................... 2430.5 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES.............................. 2423.2 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY.......... 2434.3 SECONDS

QUEUE LENGTH
AVERAGE...................................... 309.9 VEHICLES
95TH PERCENTILE..............................-851.6 VEHICLES

LEVEL OF SERVICE --- E ---

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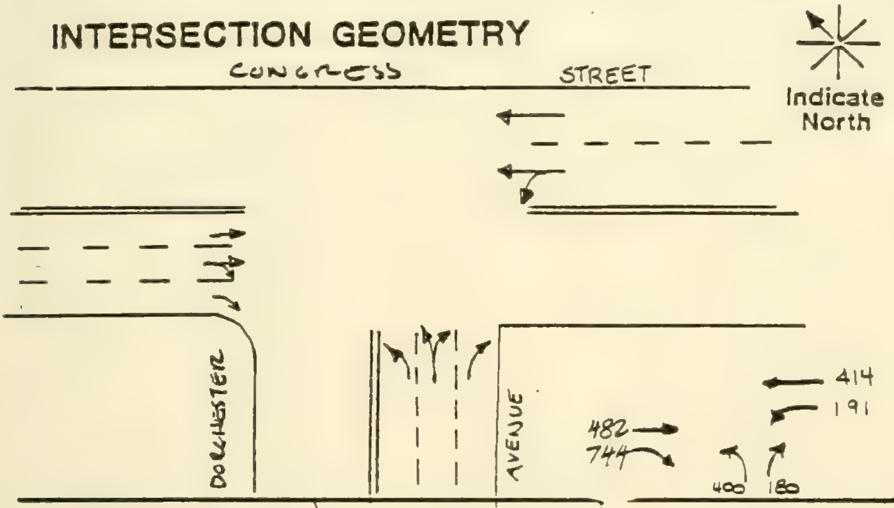
INTERSECTION CONGRESS ST/DORCHESTER AVE.
ALT. NO · BUILD YEAR 1990 PERIOD AM
CALCULATED BY DJD DATE 4/26/84 SHEET ___ OF ___
CHECKED BY FG DATE 8/12/84 JOB NO. 0923

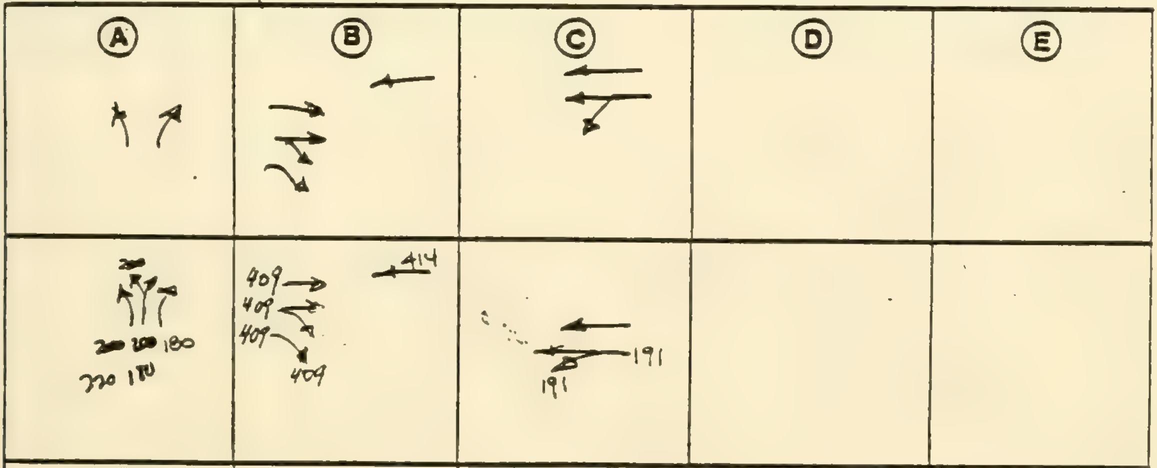
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3 Ø



A	B	C	D	E
CLV= ~~200~~ 220	CLV= 409	CLV= 191	CLV=	CLV=

ADJ

Σ CLV 1025 820

V/C .72

LOS C

20% REDUCTION FOR PEDS

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

VH

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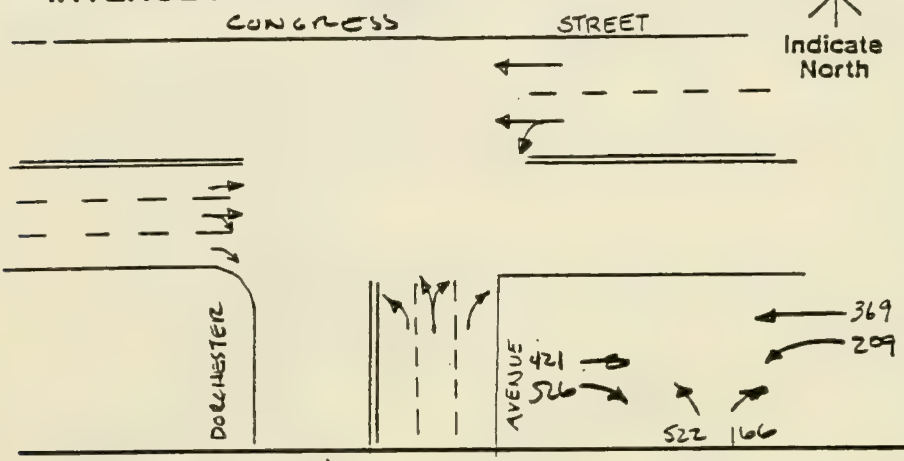
INTERSECTION CONGRESS ST/DORCHESTER AVE.
ALT. NO BUILD YEAR 1990 PERIOD PM
CALCULATED BY D.J.D. DATE 4/30/94 SHEET OF
CHECKED BY RR DATE [illegible] JOB NO. 0788/92

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3 Ø

A	B	C	D	E
235, ~~301~~ 287, 166	316, 315, 316, 316	53, 209, 209		
CLV= ~~301~~ 287	CLV= 316	CLV= 209	CLV=	CLV=

Σ CLV ~~806~~ 812 ADJ 1015
V/C ~~0.59~~ .71
LOS ~~B~~ C
20% Reduction For Peds

CRITERIA (vph)		2 Ø	ADJ	3 Ø	4 Ø
LOS	A	900	684	855	825
	B	1050	800	1000	965
	C	1200	912	1140	1100
	D	1350	1020	1275	1225
	E	1500	1140	1425	1375

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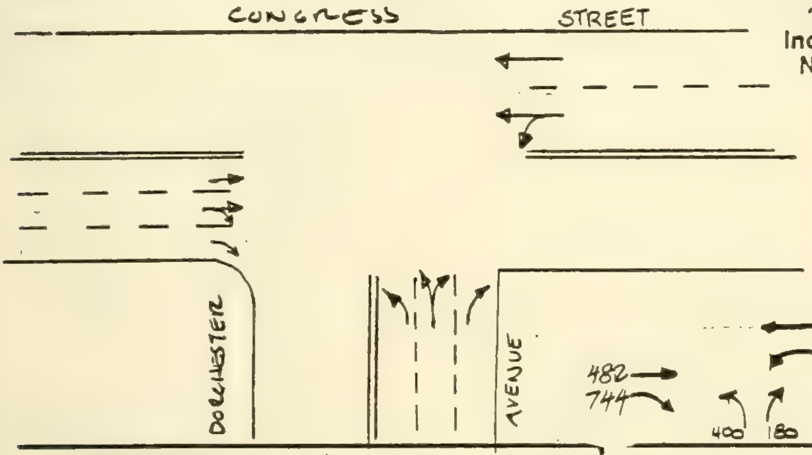
INTERSECTION CONGRESS ST/DORCHESTER AVE.
ALT. BUILD YEAR 1990 PERIOD AM
CALCULATED BY DJD DATE 4/26/84 SHEET ___ OF ___
CHECKED BY RB DATE 8/13/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3 Ø

A	B	C	D	E
220 180	409 409 409 409 414	191 191		
CLV= 220	CLV= 409	CLV= 191	CLV=	CLV=

Σ CLV 820 1025 ~~800~~
AOT
V/C .72 ~~0.81~~
LOS C B
20% REDUCTION FOR PEDS

CRITERIA (vph)		2 Ø	AOT	3 Ø	4 Ø
LOS	A	900	[illegible]	855	825
	B	1050	[illegible]	1000	965
	C	1200	912	1140	1100
	D	1350	[illegible]	1275	1225
	E	1500	1140	1425	1375

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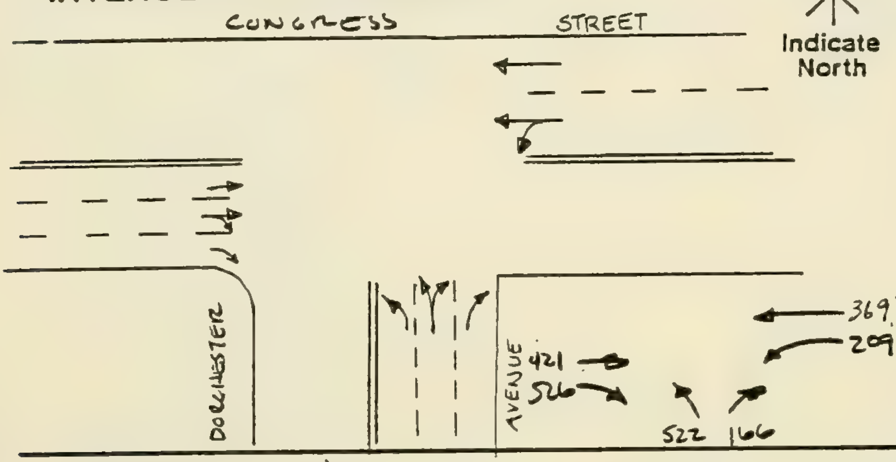
INTERSECTION CONGRESS ST/DORCHESTER AVE.
ALT. BUILD YEAR 1990 PERIOD PM
CALCULATED BY D.J.D. DATE 4/30/84 SHEET OF
CHECKED BY RB DATE 5/1/84 JOB NO. 0788/923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3Ø

(A)	(B)	(C)	(D)	(E)
287 225 166	315 316 316 316	53 209 209		
CLV= 287	CLV= 316	CLV= 209	CLV=	CLV=

Σ CLV 812 ADJ. 1015
V/C .71
LOS C
20% Reduction For Peds

CRITERIA (vph)		2 Ø	ADJ	3 Ø	4 Ø
LOS	A	900	684	855	825
	B	1050	800	1000	965
	C	1200	912	1140	1100
	D	1350	1020 1140	1275	1225
	E	1500		1425	1375

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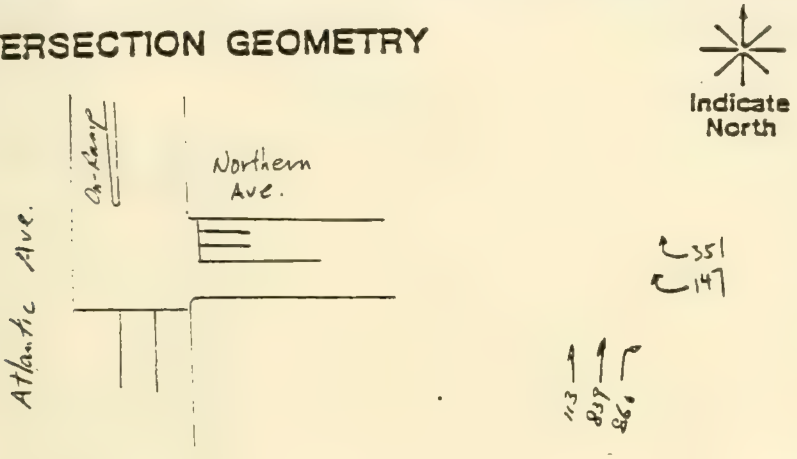
INTERSECTION Atlantic Ave. / Northern Ave.
ALT. Existing YEAR PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 8/13/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
↑↱	↰ ←			
476 476 860 *	279 224			
CLV= 476	CLV= 279	CLV=	CLV=	CLV=

* OK ∴ RT is free flow

Σ CLV 750
V/C 0.50
LOS A

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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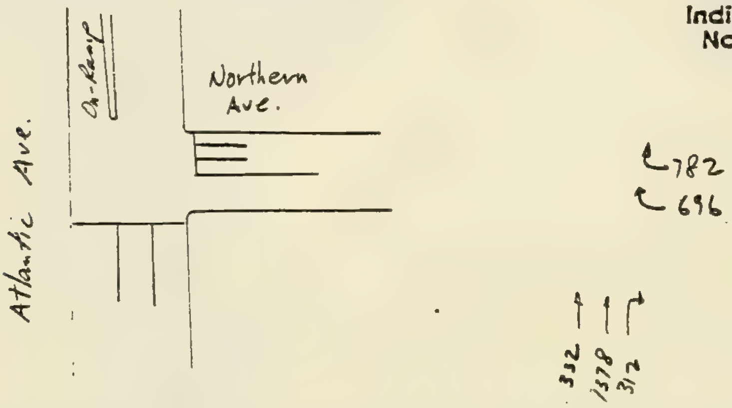
INTERSECTION Atlantic Ave. / Northern Ave.
ALT. Existing YEAR ______ PERIOD PM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY KB DATE 8/13/86 JOB NO. 0923

INTERSECTION GEOMETRY

Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

A	B	C	D	E
674 674 674	591 591 296 *			
CLV= 674	CLV= 591	CLV=	CLV=	CLV=

* During 1/2 hour of the peak hour, the third lane is utilitied based on field observations.

Σ CLV 1265
V/C 0.84
LOS D

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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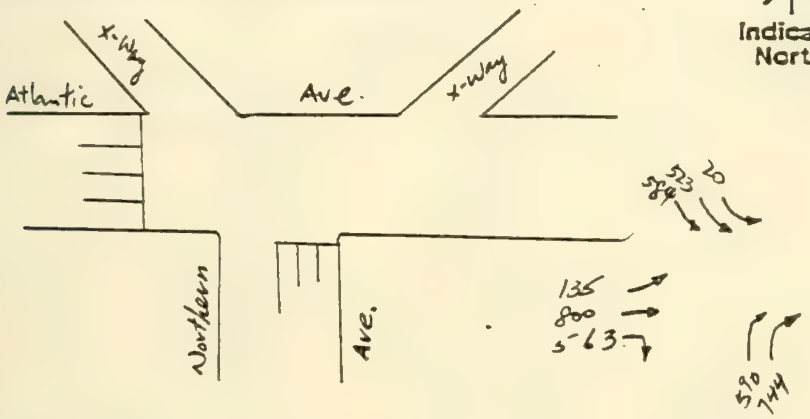
INTERSECTION ATLANTIC AVE/NORTHERN AVE
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY GG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 8/13 JOB NO. 0423

INTERSECTION GEOMETRY

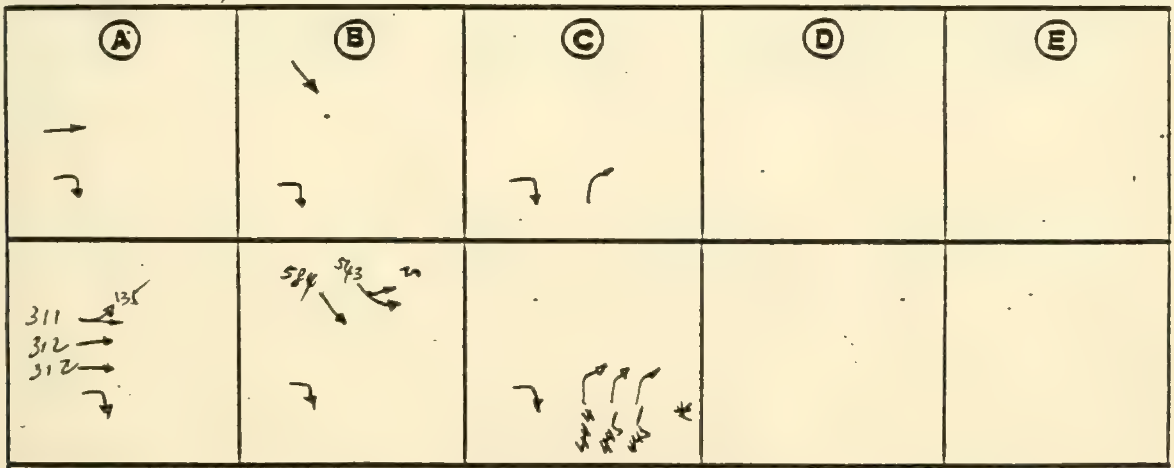


Indicate North

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3Ø



A	B	C	D	E
CLV= 312	CLV= 584	CLV= 445	CLV=	CLV=

* FLAT DIST OK due to high ramp volume

ADJ

Σ CLV 1341 1577

V/C 1.11

LOS E

15% Reduction for Peds

CRITERIA (vph)		2 Ø		3 Ø	4 Ø
LOS	A	900	727	855	825
	B	1050	850	1000	965
	C	1200	964	1140	1100
	D	1350	[illegible]	1275	1225
	E	1500	[illegible]	1425	1375

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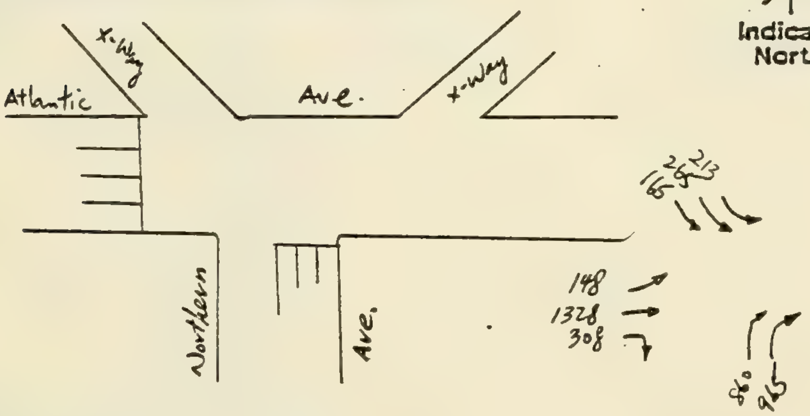
INTERSECTION ATLANTIC AVE/NORTHERN AVE
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RP DATE 7/13 JOB NO. 0423

INTERSECTION GEOMETRY



Indicate North

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3Ø

A	B	C	D	E
148 492 492 492	322 321 213	608 960 965		
CLV= 492	CLV= 322	CLV= 609	CLV=	CLV=

Σ CLV 1423 ADJ 1674

V/C 1.18

LOS E

15% Reduction for Peds

CRITERIA (vph)		2 Ø	ADJ	3 Ø	4 Ø
LOS	A	900	727	855	825
	B	1050	850	1000	965
	C	1200	969	1140	1100
	D	1350	1084	1275	1225
	E	1500	1211	1425	1375

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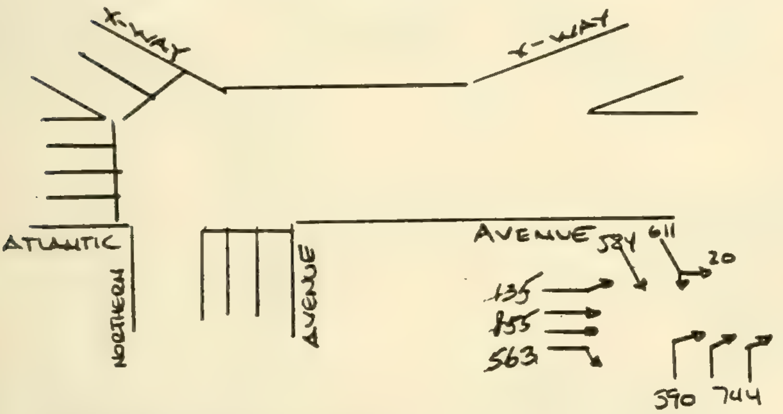
INTERSECTION Atlantic Avenue at Northern Avenue
ALT. BUILD YEAR 1990 PERIOD AM
CALCULATED BY DJD DATE 4/27/84 SHEET ___ OF ___
CHECKED BY KR DATE 7/3 JOB NO. 0788/92

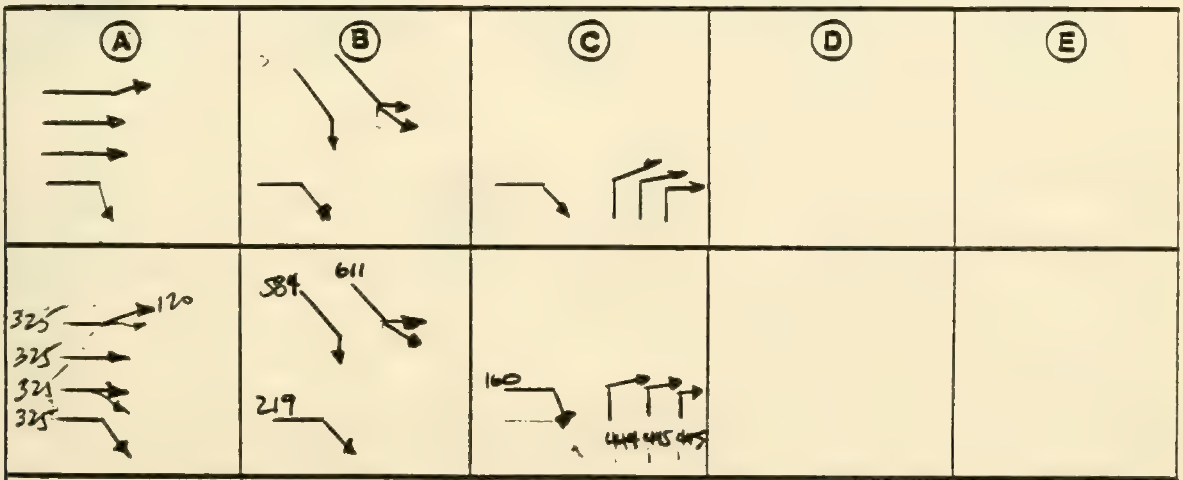
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	Approach 2	Approach 3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3ø



A	B	C	D	E
CLV= 325	CLV= 611	CLV= 445	CLV=	CLV=

Σ CLV 1381 ADJ 1624
V/C 1.14
LOS E

Adj. for 15% ped

CRITERIA (vph)		2 ø	ADJ	3 ø	4 ø
LOS	A	900	727	855	825
	B	1050	850	1000	965
	C	1200	969	1140	1100
	D	1350	1084	1275	1225
	E	1500	1211	1425	1375

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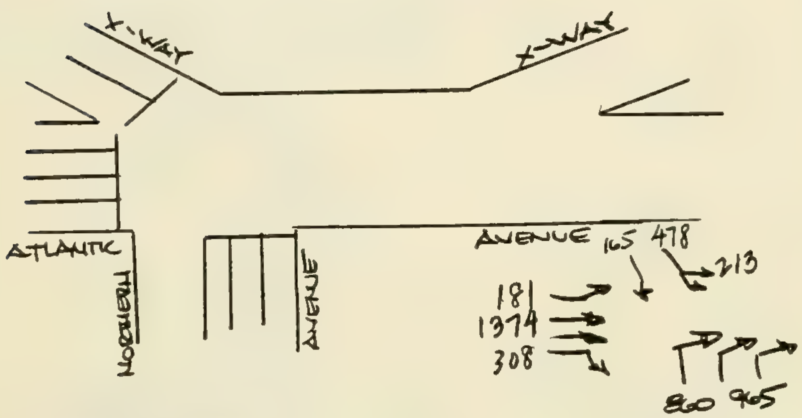
INTERSECTION Atlantic Avenue at Northern Ave
ALT. BUILD YEAR 1990 PERIOD PM
CALCULATED BY DSD DATE 4/30/84 SHEET ___ OF ___
CHECKED BY RR DATE ___ JOB NO. 0788

INTERSECTION GEOMETRY

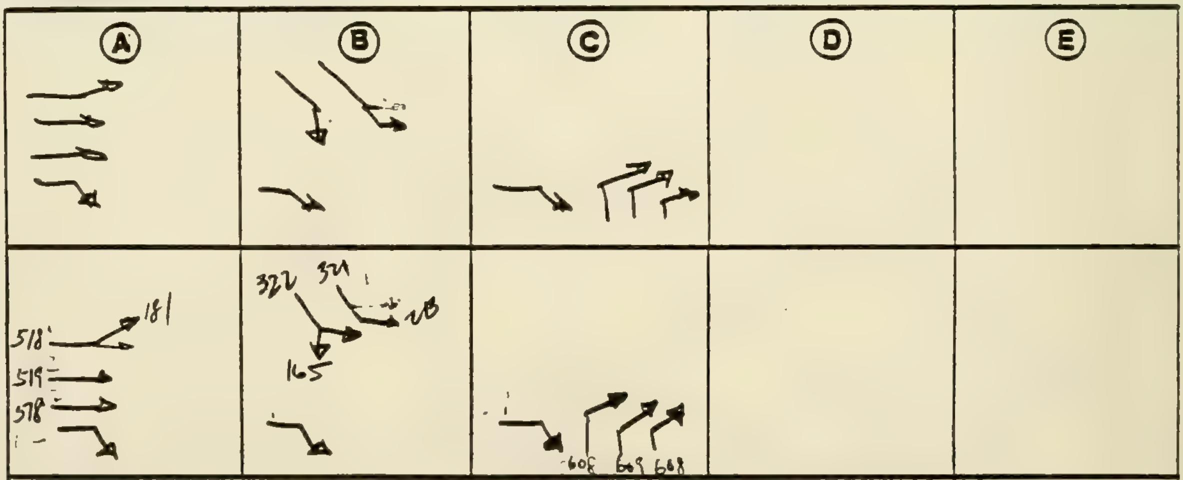
Indicate North



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > 0)?			

PHASING 3Ø



A	B	C	D	E
CLV= 519	CLV= 322	CLV= 609	CLV=	CLV=

Σ CLV 1450 ADJ 1706
V/C 1.20
LOS E

CRITERIA (vph)		2 Ø	ADJ	3 Ø	4 Ø
LOS	A	900	727	855	825
	B	1050	852	1000	965
	C	1200	969	1140	1100
	D	1350	1054	1275	1225
	E	1500	1211	1425	1375

Adj 15% FOR PEDS

K

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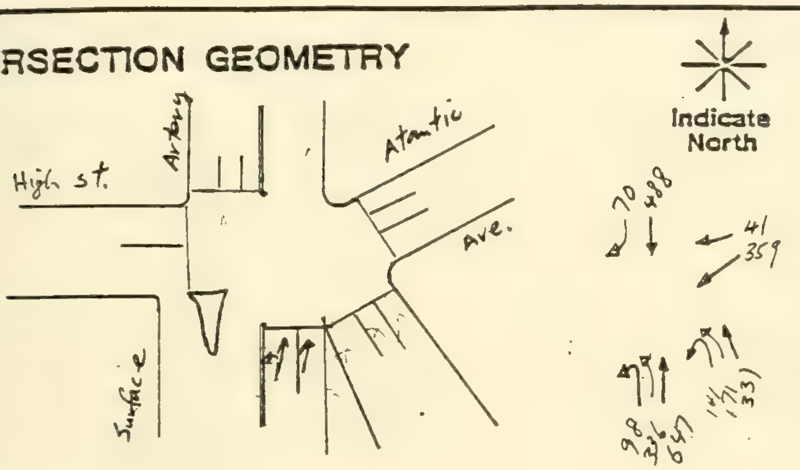
INTERSECTION ATLANTIC AVE / HIGH ST. / SURFACE ARTERY
ALT. Existing YEAR 1984 PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 8/.. JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING use 3 ∅ w/ ADV

A	B	C	D	E
30% Green time 8 cars per cycle 320 320	244 244 114 327 312	200 200 use two lanes	156 156 0 *	
CLV= 320	114 + 244 CLV= 358	CLV= 200	CLV= 156	CLV=

* 50/50 split OK as outside turn volume > inside volume.

Σ CLV 1034
V/C 0.73
LOS C

CRITERIA (vph)		2 ∅	3 ∅	4 ∅
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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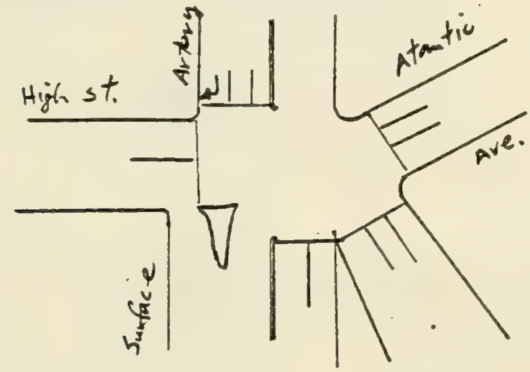
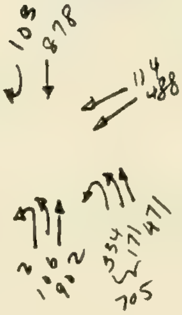
INTERSECTION ATLANTIC AVE / HIGH ST. / SURFACE ARTERY
ALT. Exist. YEAR 1984 PERIOD PM
CALCULATED BY BG DATE ______ SHEET __ OF __
CHECKED BY KB DATE 8/10 JOB NO. D923

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING use 3 Ø

A	B	C	D	E
				36×4 = 144
6% green time 2 cars per cycle 72 72 72	439 431 36 399 487 399	301 301 use two lanes	388 317 0	
CLV= 72	CLV= 487	CLV= 301	CLV= 388	CLV=

Carryover
36 830 399

Σ CLV 1248
V/C 0.88
LOS D

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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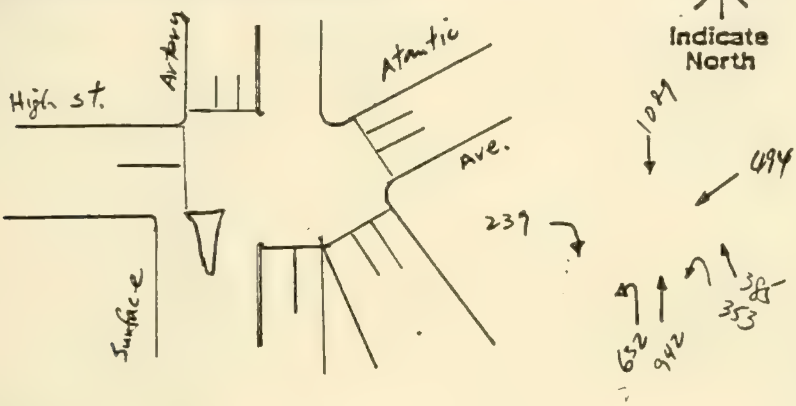
INTERSECTION ATLANTIC AVE / HIGH ST. / SURFACE ARTERY
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE 9/11 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3 ϕ

A	B	C	D	E
25% Assigned Green TIME 58 110 180	363 363 363 212 452 8 452 762	247 247 239	194 759 115	
CLV= 180	CLV= 452+363	CLV= 247	CLV= 194	CLV=

carry over : 452 . 762 → use OPP VOL = (363 x 1.5) = 544 LT Factor = 2.0

Σ CLV 1436
V/C 1.01
LOS E

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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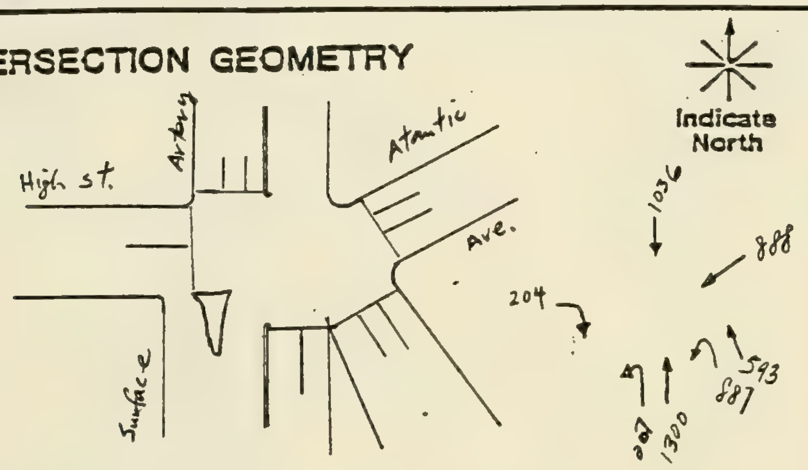
INTERSECTION ATLANTIC AVE/HIGH ST./SURFACE ARTERY
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY ____ DATE ____ SHEET ___ OF ___
CHECKED BY ____ DATE ____ JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3 ϕ

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
207 207 76	345 346 345 / 104 495 599 517	204 444 444	488 399 0	
CLV= 207	CLV= 599	CLV= 444	CLV= 488	CLV=

Since mixed vehicles on advance
Assume: of 207, 1/2 are LT. Hence: Compare = 104 990

OPP vol = 346 x 1.5 = 519 LT FAC = 2.0

Σ CLV 1738
V/C 1.22
LOS E

CRITERIA (vph)		2 ϕ	3 ϕ	4 ϕ
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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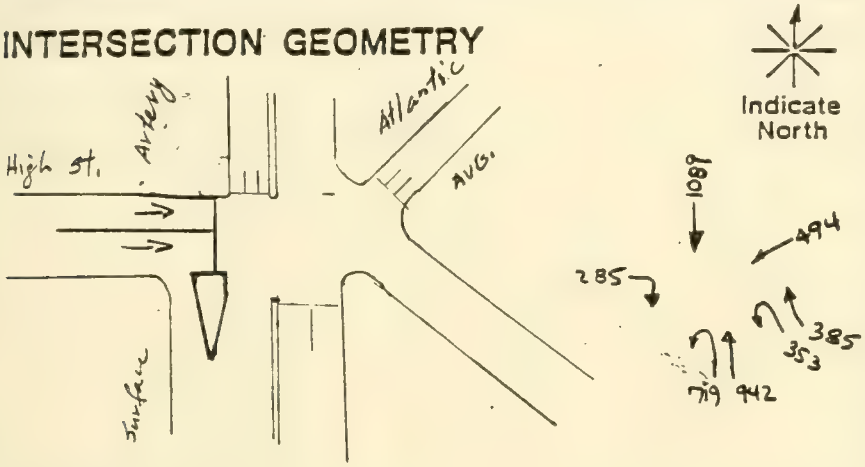
INTERSECTION ATLANTIC AVE / HIGH ST. / SURFACE ARTER
ALT. BUILD YEAR 1990 PERIOD AM
CALCULATED BY D.J.D. DATE 4/26/84 SHEET ___ OF ___
CHECKED BY RB DATE ___ JOB NO. 0788

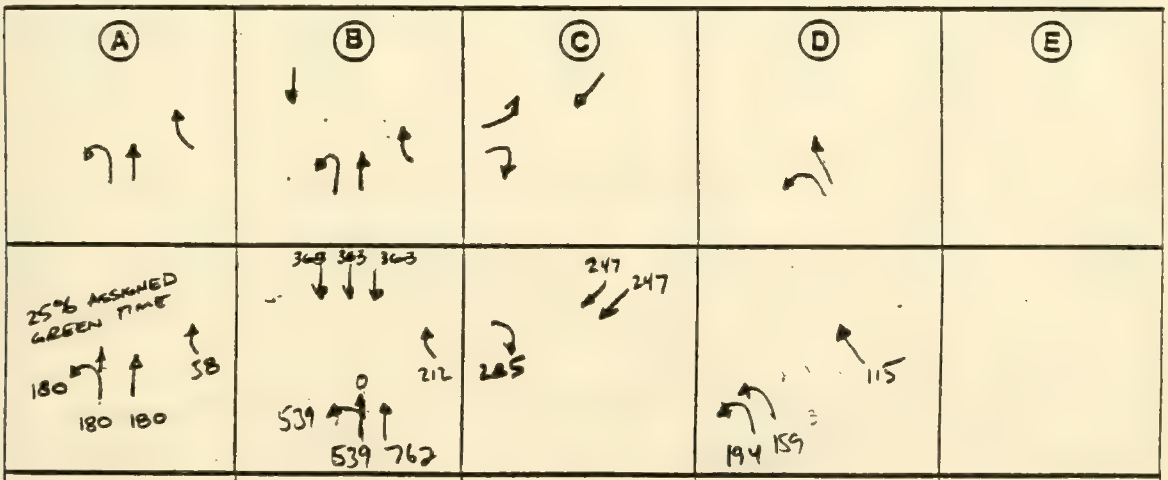
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)	NB LT Prohib			
g. Left turn volume in vph				
h. Is volume > capacity (g > 0)?				

PHASING



A	B	C	D	E
CLV= 180	CLV= 539+363	CLV= 285	CLV= 194	CLV=

Carryover

539 762

LT @ 2.0

Σ CLV 1561
V/C 1.10
LOS E

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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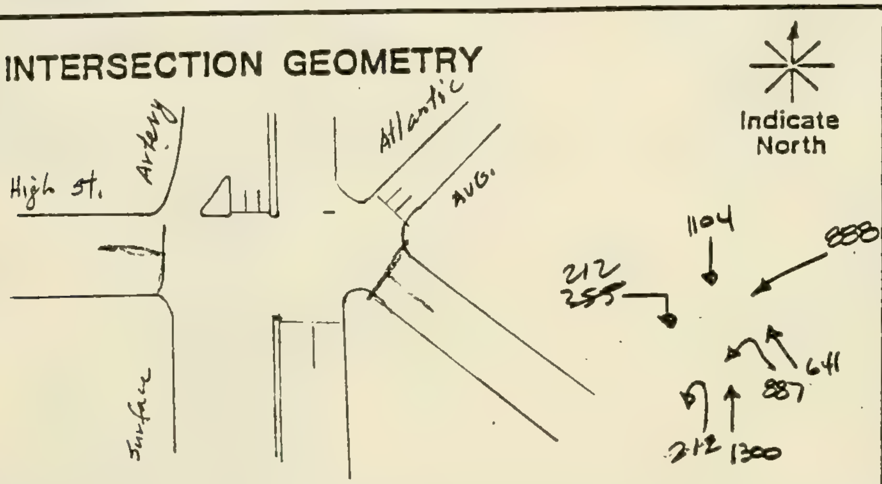
INTERSECTION ATLANTIC AVE / HIGH ST. / SURFACE ARTER
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE 4-13-84 SHEET ___ OF ___
CHECKED BY AB DATE 8-13 JOB NO. 0788

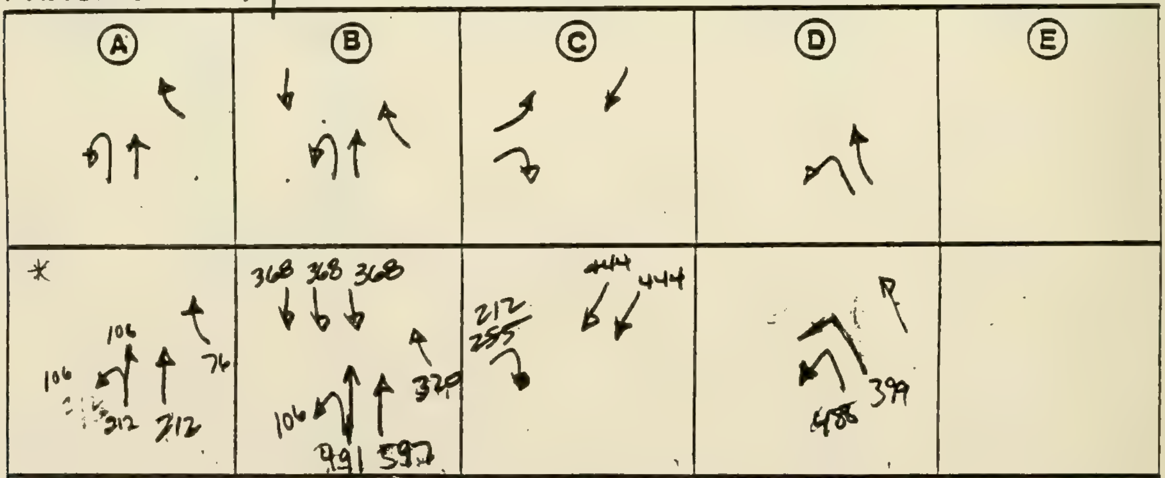
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 3φ



A	B	C	D	E
CLV= 212	CLV= 597	CLV= 444 ✓	CLV= 488	CLV=

* Assume only 1/2 LTS as mixed traffic

CARRY OVER 106 982

Σ CLV 1741
V/C 1.22
LOS E

CRITERIA (vph)		2 ø	3 ø	4 ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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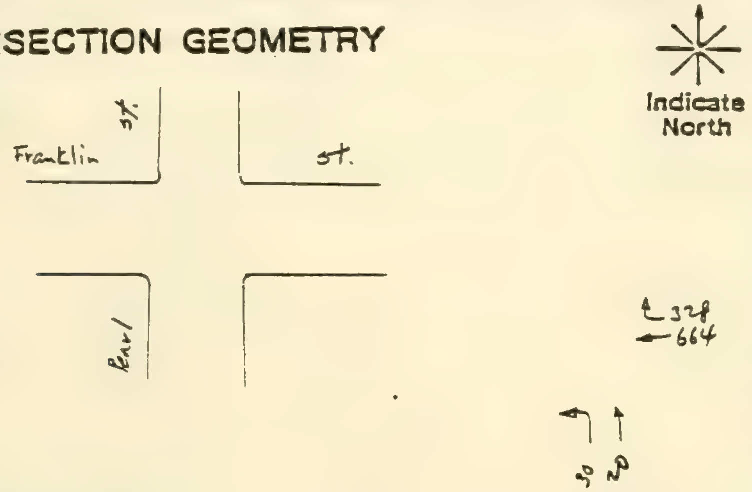
INTERSECTION FRANKLIN ST. /PEARL ST
ALT. Existing YEAR ______ PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 8/13/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

A	B	C	D	E
30 50	328 496 496			
CLV= 50	CLV= 496	CLV=	CLV=	CLV=

Σ CLV 546 ADJ 682

V/C 0.46

LOS A

20% Reduction for Peds

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	[illegible]	1200	1140	1100
	D	[illegible]	1350	1275	1225
	E	1200	1500	1425	1375

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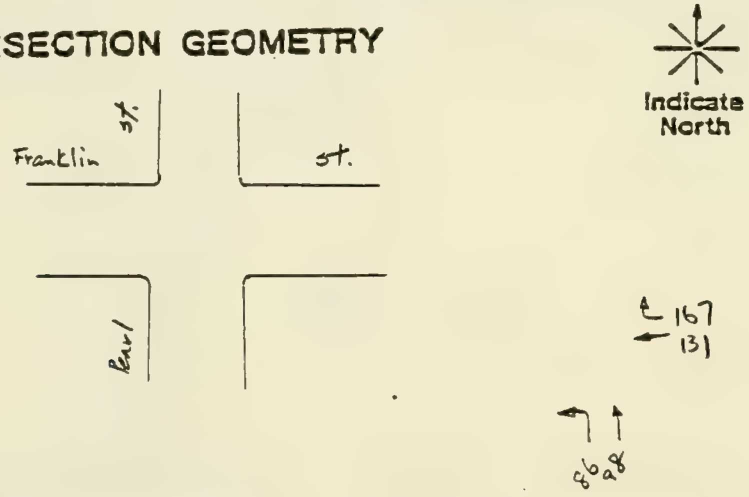
INTERSECTION FRANKLIN ST. / PEARL ST
ALT. Existing YEAR ____ PERIOD PM
CALCULATED BY GG DATE ____ SHEET ___ OF ___
CHECKED BY RB DATE 8/13/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ϕ

A	B	C	D	E
16 184	167 131			
CLV= 184	CLV= 167	CLV=	CLV=	CLV=

Σ CLV 351 ADJ 439
V/C 0.29
LOS A
20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ϕ	3 ϕ	4 ϕ
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

VH

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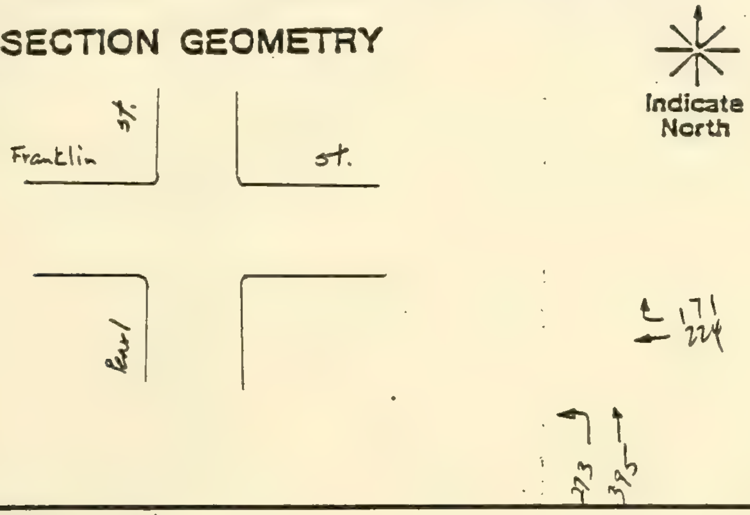
INTERSECTION FRANKLIN ST. / PEARL ST
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ____ SHEET ____ OF ____
CHECKED BY KB DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ø

A	B	C	D	E
273 / 334	171 / 198 / 197			
CLV= 334	CLV= 198	CLV=	CLV=	CLV=

Σ CLV 532 ADJ 665
V/C 0.44
LOS A
20% Reduction for Peds

CRITERIA (vph)		1 ø	2 ø	3 ø	4 ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1050	1350	1275	1225
	E	1200	1500	1425	1375

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INTERSECTION FRANKLIN ST. / PEARL ST
ALT. No-Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 8/90 JOB NO. 0923

INTERSECTION GEOMETRY

Franklin St. St.

Pearl

Indicate North

179
101

218 285

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ϕ

A	B	C	D	E
218 0 251 252	179 0 101			
CLV= 252	CLV= 179	CLV=	CLV=	CLV=

Σ CLV 431 ADJ 539
V/C 0.36
LOS A
20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ϕ	3 ϕ	4 ϕ
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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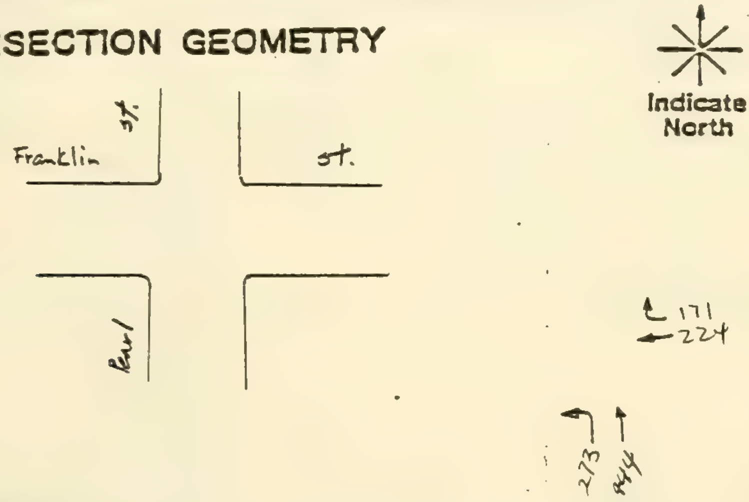
INTERSECTION FRANKLIN ST. / PEARL ST
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 8/13/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

A	B	C	D	E
273 358 359	198 197			
CLV= 359	CLV= 198	CLV=	CLV=	CLV=

Σ CLV 557

ADJ 696

V/C 0.46

LOS A

20% Reduction for Peds

CRITERIA (vph)		2 Ø (adj)	2 Ø	3 Ø	4 Ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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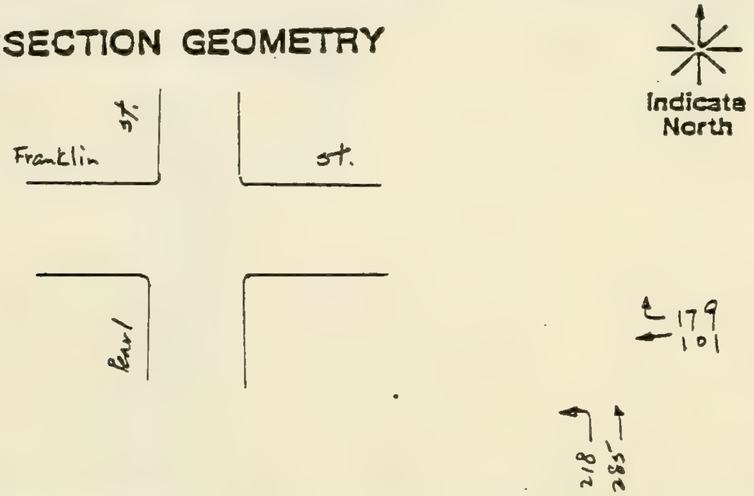
INTERSECTION FRANKLIN ST. / PEARL ST
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY DJD DATE 4/30/84 SHEET ___ OF ___
CHECKED BY DG DATE ______ JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø

A	B	C	D	E
218 252 281	179 101			
CLV= 252	CLV= 179	CLV=	CLV=	CLV=

Σ CLV 431
ADJ 539
V/C 0.36
LOS A
20% Reduction for Peds

CRITERIA (vph)		1Ø	2 Ø	3 Ø	4 Ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON,MA.
FRANKLIN ST./OLIVER ST.
1984 AM EXISTING - TOTAL OUT FROM OLIVER ST.

DATA

```
FIRST VEHICLE CRITICAL GAP, T1, .................... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ................................ 2.5 SECONDS

OPPOSING TRAFFIC
       VOLUME....................................... 276 VPH
       ARRIVAL RATE................................. .077 VPS
ANALYSIS MOVEMENT TRAFFIC
       VOLUME....................................... 318 VPH
       ARRIVAL RATE................................. .088 VPS
```

RESULTS

CAPACITY= 916 VPH

RESERVE CAPACITY= 598 VPH

```
ACCEPTABLE GAPS
       PERCENT OF ALL GAPS.......................... 68.2 PERCENT
       AVERAGE LENGTH............................... 18 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
       TO ALL VEHICLES.............................. .1 SECONDS
       TO DELAYED VEHICLES ONLY..................... 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
       TO ALL VEHICLES.............................. 2.1 SECONDS
       TO QUEUED VEHICLES ONLY...................... 6 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
       TO ALL VEHICLES.............................. 2.2 SECONDS
       TO DELAYED AND QUEUED VEHICLES ONLY.......... 9.4 SECONDS

QUEUE LENGTH
       AVERAGE...................................... .5 VEHICLES
       95TH PERCENTILE.............................. 2.4 VEHICLES
```

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA.
FRANKLIN ST./OLIVER ST.
1984 PM EXISTING - TOTAL OUT FROM OLIVER ST.

DATA

```
FIRST VEHICLE CRITICAL GAP, T1, .................. 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ................................ 2.5 SECONDS

OPPOSING TRAFFIC
       VOLUME..................................... 236 VPH
       ARRIVAL RATE............................... .066 VPS
ANALYSIS MOVEMENT TRAFFIC
       VOLUME..................................... 207 VPH
       ARRIVAL RATE............................... .058 VPS
```

RESULTS

CAPACITY= 952 VPH

RESERVE CAPACITY= 745 VPH

```
ACCEPTABLE GAPS
       PERCENT OF ALL GAPS........................ 72.1 PERCENT
       AVERAGE LENGTH............................. 20.3 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
       TO ALL VEHICLES............................ .1 SECONDS
       TO DELAYED VEHICLES ONLY................... 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
       TO ALL VEHICLES............................ 1 SECONDS
       TO QUEUED VEHICLES ONLY.................... 4.8 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
       TO ALL VEHICLES............................ 1.1 SECONDS
       TO DELAYED AND QUEUED VEHICLES ONLY........ 8.2 SECONDS

QUEUE LENGTH
       AVERAGE.................................... .3 VEHICLES
       95TH PERCENTILE............................ 1.8 VEHICLES
```

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON,MA.
FRANKLIN ST./OLIVER ST.
1990 NO BUILD AM - TOTAL OUT FROM OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
- VOLUME................................... 297 VPH
- ARRIVAL RATE............................. .083 VPS

ANALYSIS MOVEMENT TRAFFIC
- VOLUME................................... 200 VPH
- ARRIVAL RATE............................. .056 VPS

RESULTS

CAPACITY= 897 VPH

RESERVE CAPACITY= 697 VPH

ACCEPTABLE GAPS
- PERCENT OF ALL GAPS...................... 66.2 PERCENT
- AVERAGE LENGTH........................... 17.1 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
- TO ALL VEHICLES.......................... .1 SECONDS
- TO DELAYED VEHICLES ONLY................. 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
- TO ALL VEHICLES.......................... 1.2 SECONDS
- TO QUEUED VEHICLES ONLY.................. 5.2 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
- TO ALL VEHICLES.......................... 1.3 SECONDS
- TO DELAYED AND QUEUED VEHICLES ONLY....... 8.6 SECONDS

QUEUE LENGTH
- AVERAGE.................................. .3 VEHICLES
- 95TH PERCENTILE.......................... 1.8 VEHICLES

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA.
FRANKLIN ST./OLIVER ST.
1990 NO BUILD PM - TOTAL OUT FROM OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME... 260 VPH
ARRIVAL RATE................................... .072 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME... 20 VPH
ARRIVAL RATE................................... .006 VPS

RESULTS

CAPACITY= 930 VPH

RESERVE CAPACITY= 910 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS.......................... 69.7 PERCENT
AVERAGE LENGTH............................... 18.8 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES.............................. .1 SECONDS
TO DELAYED VEHICLES ONLY..................... 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES.............................. .1 SECONDS
TO QUEUED VEHICLES ONLY...................... 4 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES.............................. .2 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY.......... 7.4 SECONDS

QUEUE LENGTH
AVERAGE...................................... 0 VEHICLES
95TH PERCENTILE.............................. .8 VEHICLES

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.2 15AUG83

BOSTON, MA.
FRANKLIN ST./OLIVER ST.
1990 BUILD AM - OLIVER ST. EB

DATA

FIRST VEHICLE CRITICAL GAP, T1, ...	5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ...	3 SECONDS
MOVE UP TIME, B2, ...	2.5 SECONDS
MAIN STREET HOURLY TRAFFIC VOLUME:	338 VPH
MAIN STREET ARRIVAL RATE:	.0938889 VPS
SIDE STREET HOURLY TRAFFIC VOLUME:	200 VPH
SIDE STREET ARRIVAL RATE:	.0555556 VPS

RESULTS

CAPACITY= 861 VPH

RESERVE CAPACITY= 661 VPH

PERCENT ACCEPTABLE GAPS:	62.535 PERCENT
AVERAGE ACCEPTABLE GAP LENGTH:	15.6509 SECONDS
AVERAGE DELAY:	.147355 SECONDS
AVERAGE DELAY TO A DELAYED VEHICLE: ...	3.44512 SECONDS
AVERAGE WAIT IN QUEUE:..................	1.26491 SECONDS
AVERAGE WAIT WHEN QUEUED:..............	5.44581 SECONDS
AVERAGE DELAY :........................	1.41227 SECONDS
AVERAGE TOTAL DELAY AND WAIT:..........	8.89094 SECONDS
AVERAGE QUEUE LENGTH:..................	.302545 VEHICLES
NINETY-FIFTH PERCENTILE QUEUE..........	1.87103 VEHICLES

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA.
FRANKLIN ST./OLIVER ST.
1990 BUILD PM - TOTAL OUT FROM OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
 VOLUME...................................... 260 VPH
 ARRIVAL RATE................................ .072 VPS
ANALYSIS MOVEMENT TRAFFIC
 VOLUME...................................... 20 VPH
 ARRIVAL RATE................................ .006 VPS

RESULTS

CAPACITY= 930 VPH

RESERVE CAPACITY= 910 VPH

ACCEPTABLE GAPS
 PERCENT OF ALL GAPS......................... 69.7 PERCENT
 AVERAGE LENGTH.............................. 18.8 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
 TO ALL VEHICLES............................. .1 SECONDS
 TO DELAYED VEHICLES ONLY.................... 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
 TO ALL VEHICLES............................. .1 SECONDS
 TO QUEUED VEHICLES ONLY..................... 4 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
 TO ALL VEHICLES............................. .2 SECONDS
 TO DELAYED AND QUEUED VEHICLES ONLY......... 7.4 SECONDS

QUEUE LENGTH
 AVERAGE..................................... 0 VEHICLES
 95TH PERCENTILE............................. .8 VEHICLES

LEVEL OF SERVICE --- A ---

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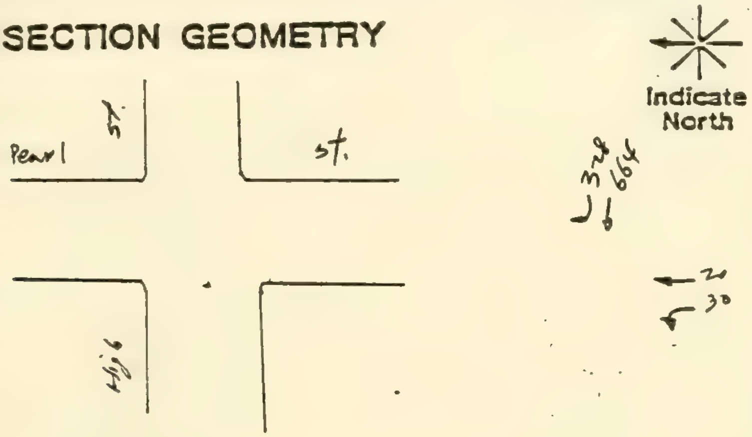
INTERSECTION HIGH ST / PEARL ST.
ALT. Existing YEAR 1984 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RR DATE 8/10 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ϕ

A	B	C	D	E
328 496 496	50			
CLV= 496	CLV= 50	CLV=	CLV=	CLV=

Σ CLV 546
V/C 0.46
LOS A

20% Reduction for Peds

ADJ
683

CRITERIA (vph)		1ϕ	2 ϕ	3 ϕ	4 ϕ
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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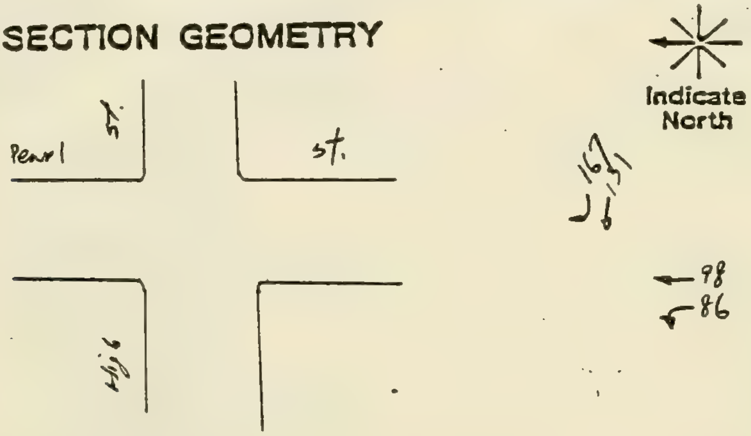
INTERSECTION HIGH ST / PEARL ST.
ALT. Existing YEAR 1984 PERIOD PM
CALCULATED BY RG DATE SHEET OF
CHECKED BY RB DATE 8/10 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
167 131	98 86			
CLV= 167	CLV= 184	CLV=	CLV=	CLV=

Σ CLV 351

V/C 0.29

LOS A

20% Reduction for Peds

ADJ
439

CRITERIA (vph)		ADJ	2 ∅	3 ∅	4 ∅
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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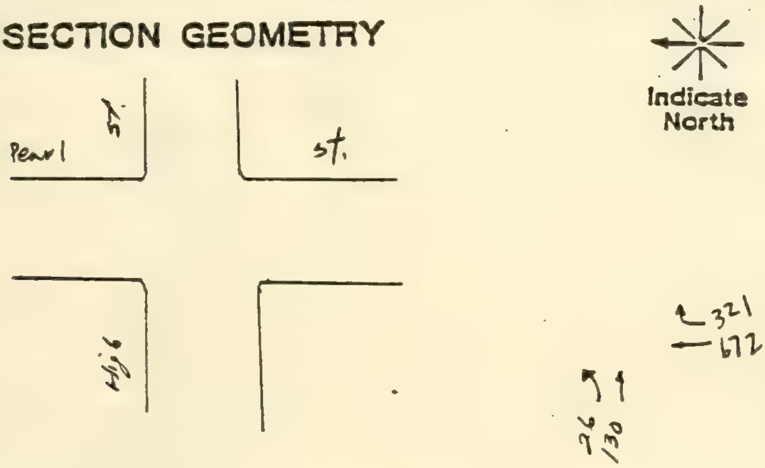
INTERSECTION HIGH ST / PEARL ST.
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE 5/3 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

(A)	(B)	(C)	(D)	(E)
↑	←			
26 78 20	321 496 497			
CLV= 78	CLV= 497	CLV=	CLV=	CLV=

Σ CLV 575 AOJ 718

V/C 0.48

LOS A

20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ∅	3 ∅	4 ∅
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

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INTERSECTION HIGH ST / PEARL ST.
ALT. No-Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 7/13 JOB NO. 0923

INTERSECTION GEOMETRY

Pearl St.

High St.

Indicate North

18
378
26
127

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ϕ

A	B	C	D	E
↑	←			
26 127 127	18 198 198			
CLV= 127	CLV= 198	CLV=	CLV=	CLV=

Σ CLV 325

V/C 0.27

LOS A

20% Reduction for Peds

405
406

CRITERIA (vph)		ACT	2 ϕ	3 ϕ	4 ϕ
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

VH

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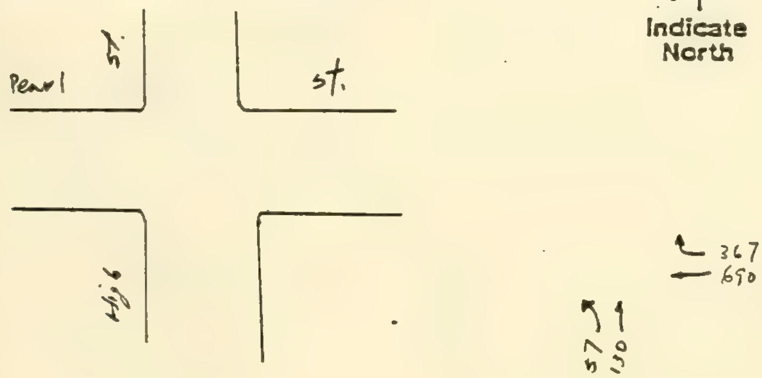
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

INTERSECTION HIGH ST / PEARL ST.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY DJD DATE SHEET OF
CHECKED BY BGT DATE 8/11/84 JOB NO. 0923

INTERSECTION GEOMETRY

Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ϕ

A	B	C	D	E
↑	←			
57 ↰↑ 94	367 ↰ 529 ← 529			
CLV= 94	CLV= 529	CLV=	CLV=	CLV=

Σ CLV 623
V/C 0.52
LOS A

ADJ 779

20% Reduction for Peds

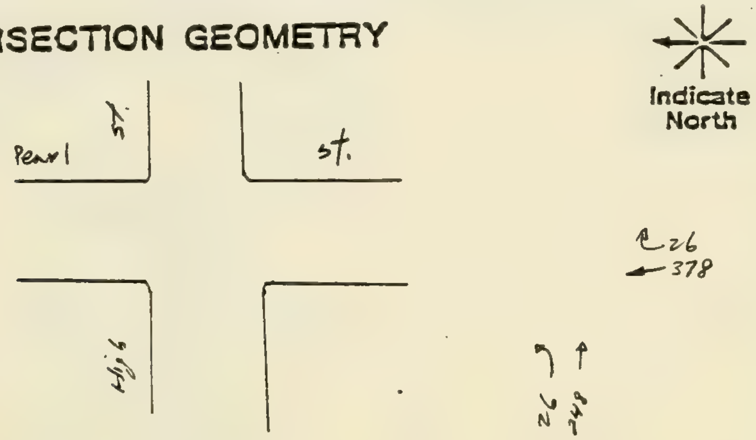
CRITERIA (vph)		ADJ	2 ϕ	3 ϕ	4 ϕ
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

VH

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

INTERSECTION HIGH ST / PEARL ST.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY WJS DATE ______ SHEET ___ OF ___
CHECKED BY DG DATE 8/11/84 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2∅

(A)	(B)	(C)	(D)	(E)
26 137 137	26 202 202			
CLV= 137	CLV= 202	CLV=	CLV=	CLV=

Σ CLV 339 ADJ 424
V/C 0.27
LOS A

20% Reduction for Peds

CRITERIA (vph)			2 ∅	3 ∅	4 ∅
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1080	1350	1275	1225
	E	1200	1500	1425	1375

```
TRAFFIC STREAM GAP ANALYSIS PACKAGE
VER 3.5.3 MARCH84

BOSTON,MA.
X-WAY OFF RAMP/HIGH ST.
EXISTING AM PEAK - HIGH ST. THRU

DATA

FIRST VEHICLE CRITICAL GAP, T1, .................. 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ................................ 2.5 SECONDS

OPPOSING TRAFFIC
       VOLUME.................................... 637 VPH
       ARRIVAL RATE.............................. .177 VPS
ANALYSIS MOVEMENT TRAFFIC
       VOLUME.................................... 354 VPH
       ARRIVAL RATE.............................. .098 VPS

RESULTS

CAPACITY= 638 VPH

RESERVE CAPACITY= 284 VPH

ACCEPTABLE GAPS
       PERCENT OF ALL GAPS....................... 41.3 PERCENT
       AVERAGE LENGTH............................ 10.7 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
       TO ALL VEHICLES........................... .3 SECONDS
       TO DELAYED VEHICLES ONLY.................. 3.6 SECONDS

AVERAGE WAIT IN A QUEUE
       TO ALL VEHICLES........................... 7 SECONDS
       TO QUEUED VEHICLES ONLY................... 12.7 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
       TO ALL VEHICLES........................... 7.3 SECONDS
       TO DELAYED AND QUEUED VEHICLES ONLY....... 16.3 SECONDS

QUEUE LENGTH
       AVERAGE................................... 1.2 VEHICLES
       95TH PERCENTILE........................... 3.7 VEHICLES

LEVEL OF SERVICE --- C ---
```

TRAFFIC STREAM GAP ANALYSIS PACKAGE
VER 3.5.3 MARCH84

BOSTON, MA.
X-WAY OFF RAMP/HIGH ST.
EXISTING PM PEAK - HIGH ST. THRU

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME.................................... 181 VPH
ARRIVAL RATE.............................. .05 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME.................................... 361 VPH
ARRIVAL RATE.............................. .1 VPS

RESULTS

CAPACITY= 1005 VPH

RESERVE CAPACITY= 644 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS........................ 77.8 PERCENT
AVERAGE LENGTH............................. 24.9 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES............................ .1 SECONDS
TO DELAYED VEHICLES ONLY................... 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES............................ 2 SECONDS
TO QUEUED VEHICLES ONLY.................... 5.6 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES............................ 2.1 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY......... 9 SECONDS

QUEUE LENGTH
AVERAGE.................................... .6 VEHICLES
95TH PERCENTILE............................ 2.5 VEHICLES

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA.
PURCHASE ST./OLIVER ST.
EXISTING AM BASE - RT OUT FROM OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME.................................... 298 VPH
ARRIVAL RATE.............................. .083 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME.................................... 460 VPH
ARRIVAL RATE.............................. .128 VPS

RESULTS

CAPACITY= 896 VPH

RESERVE CAPACITY= 436 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS........................ 66.1 PERCENT
AVERAGE LENGTH............................. 17.1 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES............................ .1 SECONDS
TO DELAYED VEHICLES ONLY................... 3.4 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES............................ 4.2 SECONDS
TO QUEUED VEHICLES ONLY.................... 8.3 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES............................ 4.4 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY......... 11.7 SECONDS

QUEUE LENGTH
AVERAGE.................................... 1.1 VEHICLES
95TH PERCENTILE............................ 3.4 VEHICLES

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON,MA
PURCHASE ST./OLIVER ST.
EXISTING PM - RT OUT FROM OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME.................................. 590 VPH
ARRIVAL RATE............................ .164 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME.................................. 130 VPH
ARRIVAL RATE............................ .036 VPS

RESULTS

CAPACITY= 669 VPH

RESERVE CAPACITY= 539 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS..................... 44.1 PERCENT
AVERAGE LENGTH.......................... 11.1 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES......................... .3 SECONDS
TO DELAYED VEHICLES ONLY................ 3.6 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES......................... 1.3 SECONDS
TO QUEUED VEHICLES ONLY.................. 6.7 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES......................... 1.6 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY......... 10.2 SECONDS

QUEUE LENGTH
AVERAGE................................. .2 VEHICLES
95TH PERCENTILE......................... 1.7 VEHICLES

LEVEL OF SERVICE --- A ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE
VER 3.5.3 MARCH84

BOSTON,MA.
PURCHASE ST./OLIVER ST.
1990 NO BUILD AM - RT OUT OF OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME.. 1625 VPH
ARRIVAL RATE.................................. .451 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME.. 20 VPH
ARRIVAL RATE.................................. .006 VPS

RESULTS

CAPACITY= 229 VPH

RESERVE CAPACITY= 209 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS........................... 10.5 PERCENT
AVERAGE LENGTH................................ 7.2 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES............................... 1.2 SECONDS
TO DELAYED VEHICLES ONLY...................... 4.4 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES............................... 1.5 SECONDS
TO QUEUED VEHICLES ONLY....................... 17.2 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES............................... 2.7 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY........... 21.6 SECONDS

QUEUE LENGTH
AVERAGE....................................... .1 VEHICLES
95TH PERCENTILE............................... 1.2 VEHICLES

LEVEL OF SERVICE --- C ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON,MA.
PURCHASE ST./OLIVER ST.
1990 NO BUILD PM - RT OUT OF OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME.. 1234 VPH
ARRIVAL RATE................................... .343 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME.. 20 VPH
ARRIVAL RATE................................... .006 VPS

RESULTS

CAPACITY= 346 VPH

RESERVE CAPACITY= 326 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS........................... 18 PERCENT
AVERAGE LENGTH............................... 7.9 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES.............................. .8 SECONDS
TO DELAYED VEHICLES ONLY..................... 4 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES.............................. .6 SECONDS
TO QUEUED VEHICLES ONLY...................... 11 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES.............................. 1.4 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY......... 15.1 SECONDS

QUEUE LENGTH
AVERAGE...................................... .1 VEHICLES
95TH PERCENTILE.............................. 1 VEHICLES

LEVEL OF SERVICE --- B ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON, MA.
PURCHASE ST./OLIVER ST.
1990 BUILD AM - RT OUT OF OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME.. 1664 VPH
ARRIVAL RATE.................................... .462 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME.. 20 VPH
ARRIVAL RATE.................................... .006 VPS

RESULTS

CAPACITY= 220 VPH

RESERVE CAPACITY= 200 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS............................. 9.9 PERCENT
AVERAGE LENGTH.................................. 7.2 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES................................. 1.3 SECONDS
TO DELAYED VEHICLES ONLY........................ 4.5 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES................................. 1.6 SECONDS
TO QUEUED VEHICLES ONLY......................... 18 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES................................. 2.9 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY.............. 22.5 SECONDS

QUEUE LENGTH
AVERAGE... .1 VEHICLES
95TH PERCENTILE................................. 1.2 VEHICLES

LEVEL OF SERVICE --- C ---

TRAFFIC STREAM GAP ANALYSIS PACKAGE

VER 3.5.3 MARCH84

BOSTON,MA.
PURCHASE ST./OLIVER ST.
1990 BUILD PM - RT OUT OF OLIVER ST.

DATA

FIRST VEHICLE CRITICAL GAP, T1, ... 5 SECONDS
ADDITIONAL TIME NEEDED FOR SECOND VEHICLE, B1, ... 3 SECONDS
MOVE UP TIME, B2, ... 2.5 SECONDS

OPPOSING TRAFFIC
VOLUME....................................... 1314 VPH
ARRIVAL RATE................................. .365 VPS
ANALYSIS MOVEMENT TRAFFIC
VOLUME....................................... 50 VPH
ARRIVAL RATE................................. .014 VPS

RESULTS

CAPACITY= 318 VPH

RESERVE CAPACITY= 268 VPH

ACCEPTABLE GAPS
PERCENT OF ALL GAPS.......................... 16.1 PERCENT
AVERAGE LENGTH............................... 7.7 SECONDS

AVERAGE DELAY TO A VEHICLE AT STOP BAR
TO ALL VEHICLES.............................. .9 SECONDS
TO DELAYED VEHICLES ONLY..................... 4.1 SECONDS

AVERAGE WAIT IN A QUEUE
TO ALL VEHICLES.............................. 2.1 SECONDS
TO QUEUED VEHICLES ONLY...................... 13.4 SECONDS

AVERAGE DELAY PLUS AVERAGE WAIT
TO ALL VEHICLES.............................. 3 SECONDS
TO DELAYED AND QUEUED VEHICLES ONLY.......... 17.5 SECONDS

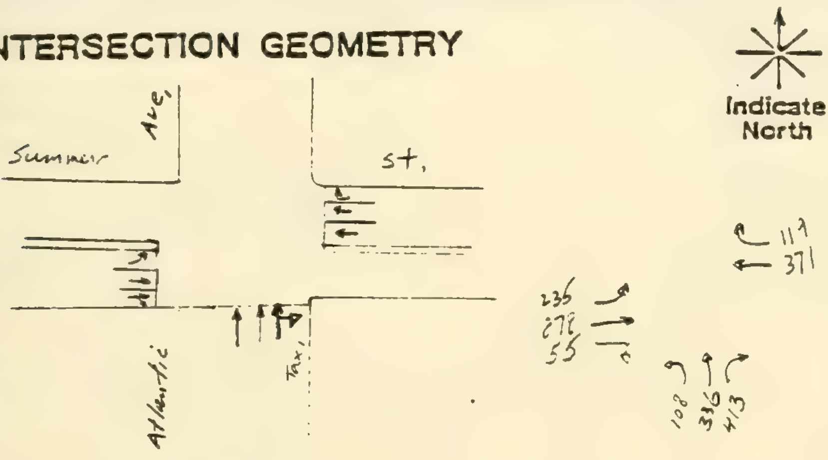
QUEUE LENGTH
AVERAGE...................................... .2 VEHICLES
95TH PERCENTILE.............................. 1.5 VEHICLES

LEVEL OF SERVICE --- C ---

VH
Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

INTERSECTION Atlantic Ave. / Summer St.
ALT. Existing YEAR ______ PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 8/13/84 JOB NO. 0423

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING ~~2φ~~ 2φ with Lead

A	B	C	D	E
108, 222, 222, 413		235, 235, 235	119, 186, 185, 232, 232	
CLV= 413	CLV=	CLV= 235	CLV= 232	CLV=

~~Use 3φ criteria~~

carryover =

AOS
1257

Σ CLV 880
V/C 0.84
LOS D

30 % Reduction for Peds

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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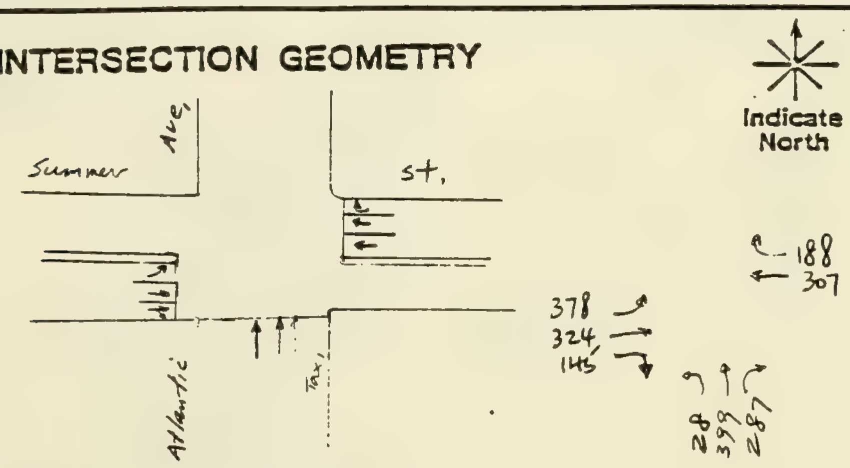
INTERSECTION Atlantic Ave. / Summer St.
ALT. Existing YEAR 1984 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE 8/13/84 JOB NO. 0923

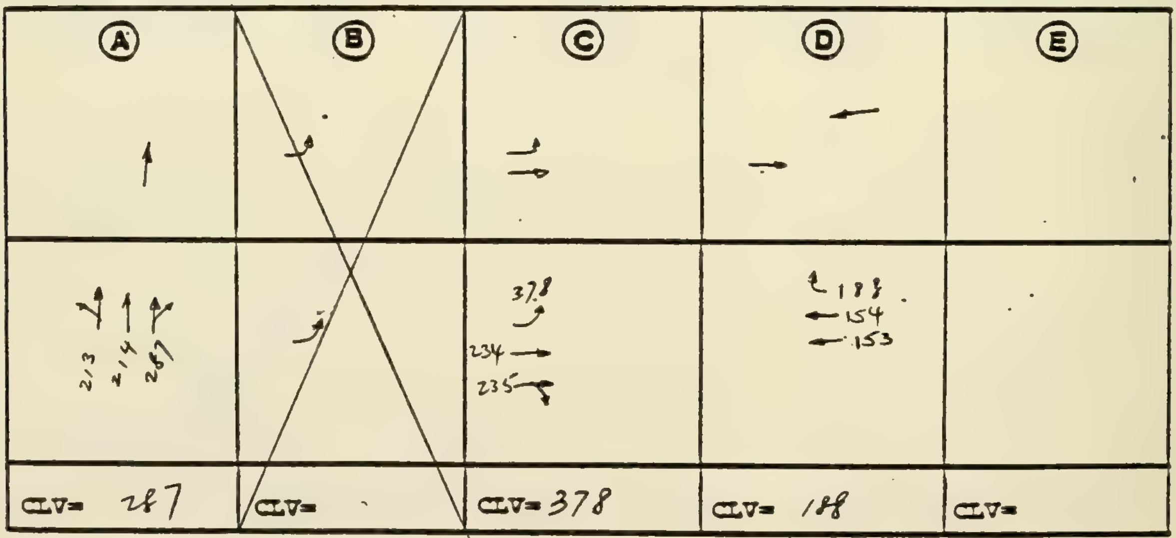
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING ~~3φ~~ 2φ with Lead



~~Use 3φ criteria~~

Σ CLV 853

V/C 0.81

LOS D

30% Reduction for Peds

AOJ
1219

CRITERIA (vph)		AOJ	2 φ		3 φ	4 φ
LOS	A	630	900		855	825
	B	735	1050		1000	965
	C	840	1200		1140	1100
	D	945	1350		1275	1225
	E	1050	1500		1425	1375

Vanasse / Hangen Engineering, Inc.

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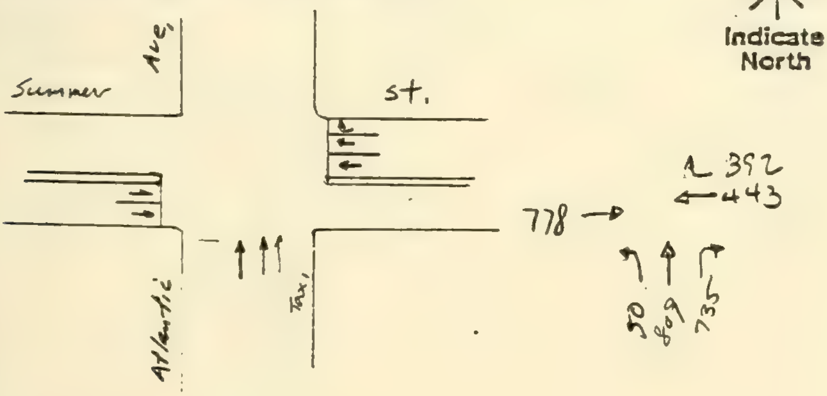
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

INTERSECTION Atlantic Ave. / Summer St.
ALT. No Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ____ SHEET ___ OF ___
CHECKED BY RB DATE 8/10 JOB NO. 0923

INTERSECTION GEOMETRY



Indicate North

Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2∅ ~~with lead~~

A	~~B~~	C	D	E
531 531 531	~~2 vehicle per cycle = 80 vehicl per hour~~	392 221 222 389 389		
CLV= 531	~~CLV=~~	CLV= 392	CLV=	CLV=

Analyzed as 2∅

ADJ 1318

Σ CLV 923

V/C 0.89

LOS D

30 % Reduction for Peds

CRITERIA (vph)		ADJ	2 ∅	3 ∅	4 ∅
LOS	A	630	900	855	825
	B	735	1050	1000	965
	C	840	1200	1140	1100
	D	945	1350	1275	1225
	E	1050	1500	1425	1375

VH

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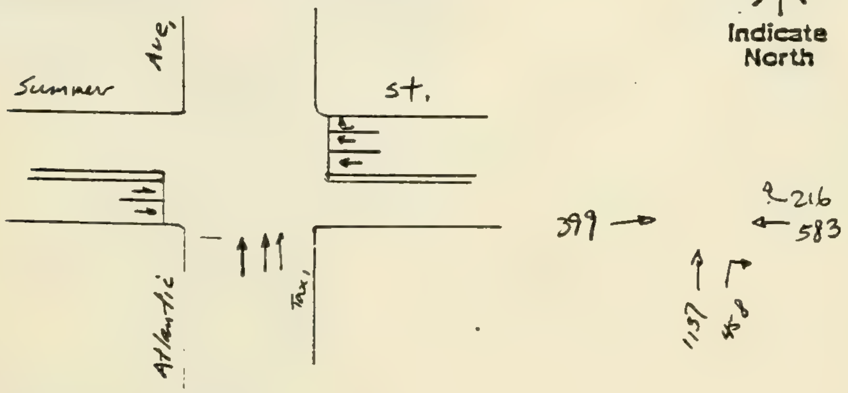
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

INTERSECTION Atlantic Ave. / Summer St.
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY SG DATE SHEET OF
CHECKED BY RB DATE 8/18 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø with Lead

A	B	C	D	E
531 532 532	72 72	128 127 216 292 291		
CLV= 532	CLV= 72	CLV= 292	CLV=	CLV=

Σ CLV 896
V/C 0.85
LOS D
30 % Reduction for Peds

ADJ 1288

CRITERIA (vph)		ACS	2 Ø	3 Ø	4 Ø
LOS	A	630	900	855	825
	B	735	1050	1000	965
	C	840	1200	1140	1100
	D	945	1350	1275	1225
	E	1050	1500	1425	1375

VH
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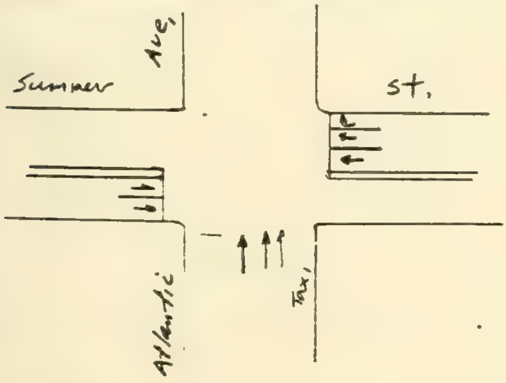
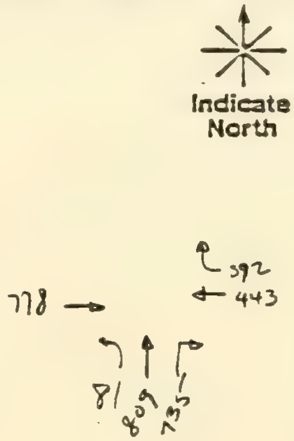
INTERSECTION Atlantic Ave. / Summer St.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY





Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø with Lead

A	~~B~~	C	D	E
542 542 541		392 221 222 389 389		
CLV= 542	CLV=	CLV= 392	CLV=	CLV=

use 2 Ø due to short lead green time

AOI 1334

Σ CLV 934
V/C 0.89
LOS D
30 % Reduction for Peds

CRITERIA (vph)		HCM	2 Ø	3 Ø	4 Ø
LOS	A	630	900	855	825
	B	735	1050	1000	965
	C	840	1200	1140	1100
	D	945	1350	1275	1225
	E	1050	1500	1425	1375

VH
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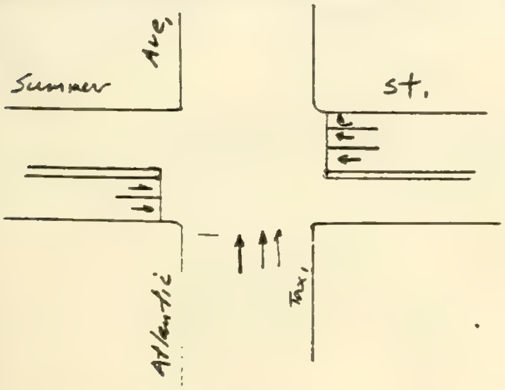
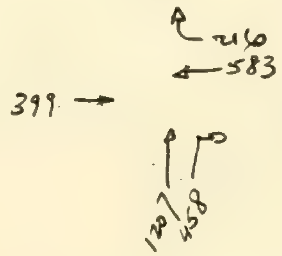
INTERSECTION Atlantic Ave. / Summer St.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø with Lead

A	B	C	D	E
↑	⇉	⇉ ⇇		
↑↑↑ 555 555 555	272 → 172 →	216, 271, 292 ←; 121 →, 127 →		
CLV= 555	CLV= 272	CLV= 292	CLV=	CLV=

ADJ.
1313

Σ CLV 919
V/C 0.87
LOS D
30 % Reduction for Peds

CRITERIA (vph)			2 Ø	3 Ø	4 Ø
LOS	A	630	900	855	825
	B	735	1050	1000	965
	C	840	1200	1140	1100
	D	945	1350	1275	1225
	E	1050	1500	1425	1375

VH

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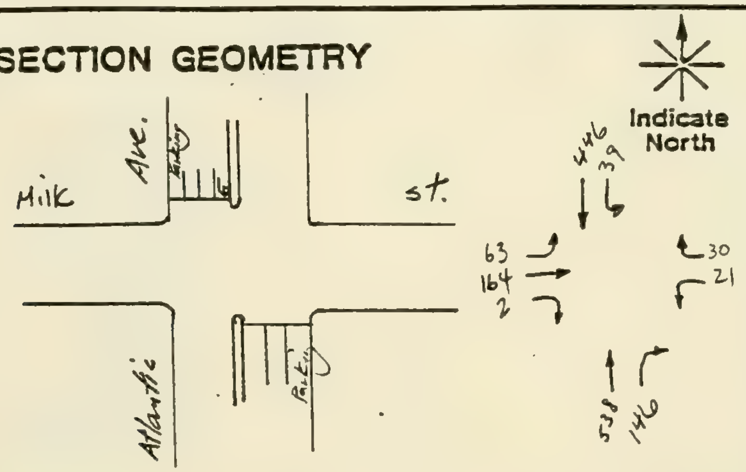
INTERSECTION Atlantic Ave. / Milk St.
ALT. Existing YEAR 1984 PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY KB DATE ______ JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2ϕ

A	B	C	D	E
223 223 39 / 342 342	63 30 / 83 21 / 83 / 2			
CLV= 342+39	CLV= 83+21	CLV=	CLV=	CLV=

Σ CLV 485

AOS / 584

V/C 0.39

LOS A

17% Reduction for Ped

CRITERIA (vph)		AOS	2 Ø	3 Ø	4 Ø
LOS	A	747	900	855	825
	B	872	1050	1000	965
	C	996	1200	1140	1100
	D	1121	1350	1275	1225
	E	1245	1500	1425	1375

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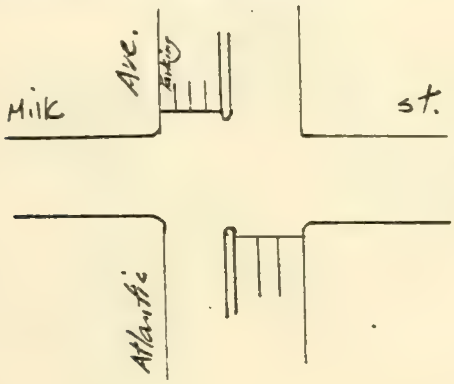
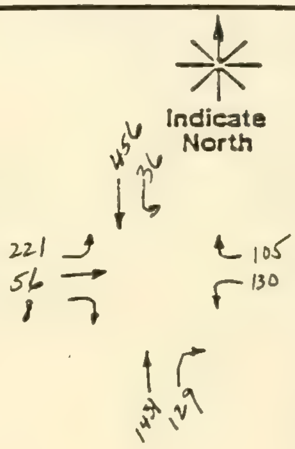
INTERSECTION Atlantic Ave. / Milk St.
ALT. Existing YEAR 1984 PERIOD PM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE ______ JOB NO. 0523

INTERSECTION GEOMETRY





Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2Ø

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
36 228 228 129 780 780	105 130 221 32 32 8			
CLV= 780+36	CLV= 221	CLV=	CLV=	CLV=

ADJ
1206

Σ CLV 1037
V/C 0.88
LOS C

14% Reduction for Peds

CRITERIA (vph)		1Ø	2 Ø	3 Ø	4 Ø
LOS	A	774	900	855	825
	B	903	1050	1000	965
	C	946	1200	1140	1100
	D	1101	1350	1275	1225
	E	[illegible]	1500	1425	1375

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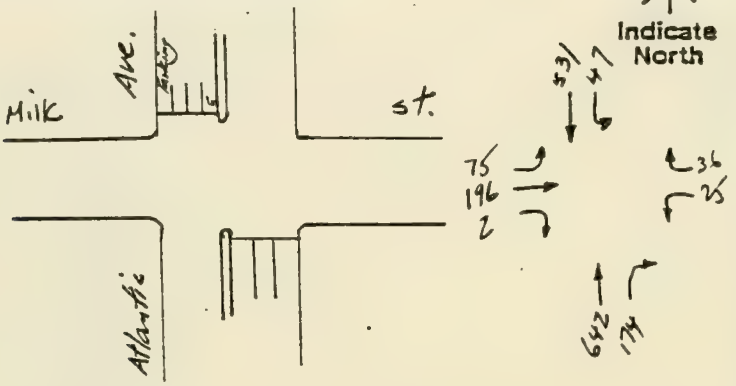
INTERSECTION Atlantic Ave. / Milk St.
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE 8/3/84 SHEET ___ OF ___
CHECKED BY RR DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)			--	
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

A	B	C	D	E
265 266 47 408 408 174	75 36 25 99 99 2			
CLV= 408+47	CLV= 99+25	CLV=	CLV=	CLV=

Σ CLV 579 ADJ .698
V/C 0.47
LOS A

17% Reduction for Peds.

CRITERIA (vph)		HST	2 Ø	3 Ø	4 Ø
LOS	A	747	900	855	825
	B	872	1050	1000	965
	C	996	1200	1140	1100
	D	1121	1350	1275	1225
	E	1245	1500	1425	1375

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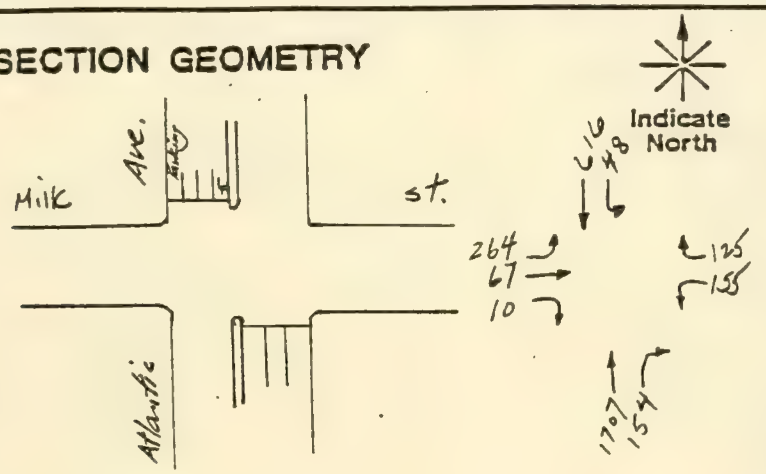
INTERSECTION Atlantic Ave. / Milk St.
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY [illegible] DATE 8/13 JOB NO. 0923

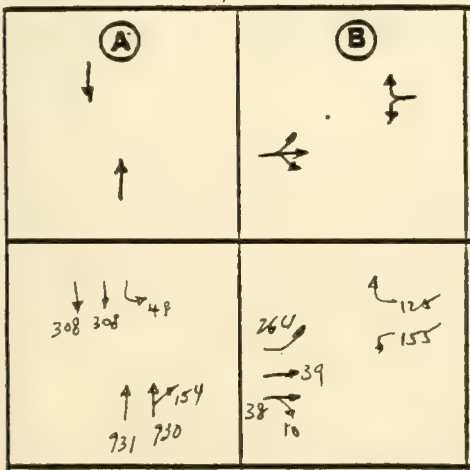
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2ϕ



A	B	C	D	E
CLV= 931+48	CLV= 264	CLV=	CLV=	CLV=

Σ CLV 1243 ADJ 1445

V/C 0.96

LOS E

14% Reduction for Peds

CRITERIA (vph)		Adj	2 Ø	3 Ø	4 Ø
LOS	A	774	900	855	825
	B	903	1050	1000	965
	C	1040	1200	1140	1100
	D	1161	1350	1275	1225
	E	1290	1500	1425	1375

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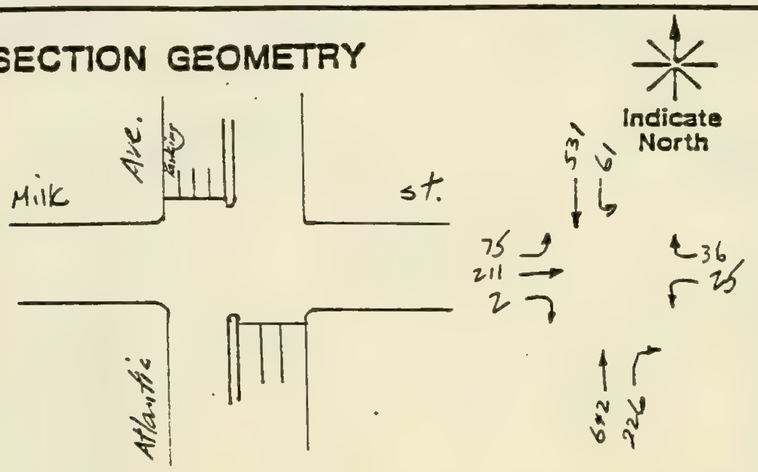
INTERSECTION Atlantic Ave. / Milk St.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ____ SHEET ___ OF ___
CHECKED BY KB DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2Ø

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
61, 266, 265, 226, 434, 434	75, 36, 107, 25, 106, 2			
CLV= 434+61	CLV= 107+25	CLV=	CLV=	CLV=

Σ CLV 627
AOS / 7.55
V/C 0.50
LOS A
17% Reduction for Peds

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	~~747~~ 747	900	855	825
	B	~~873~~ 872	1050	1000	965
	C	~~996~~ 996	1200	1140	1100
	D	~~1121~~ 1121	1350	1275	1225
	E	~~1245~~ 1245	1500	1425	1375

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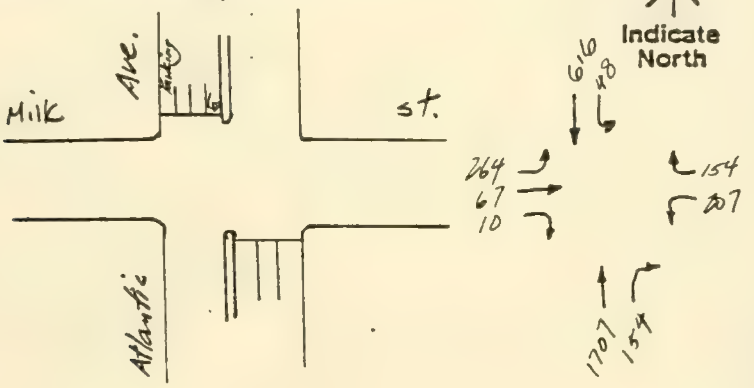
INTERSECTION Atlantic Ave. / Milk St.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE 8/13 JOB NO. 0923

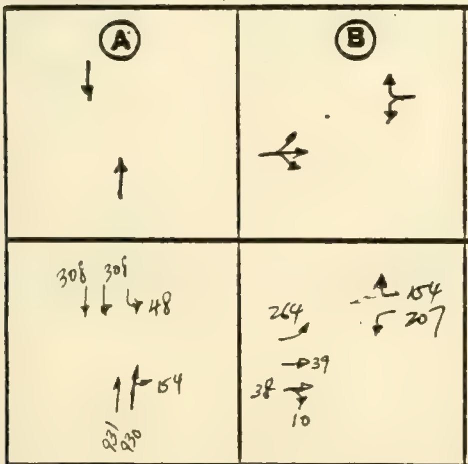
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2φ



A	B	C	D	E
CLV= 931+48	CLV= 264	CLV=	CLV=	CLV=

ΣCLV 1243 ADJ 1445
V/C 0.96
LOS E
14% Reduction for peds

CRITERIA (vph)			2 ø	3 ø	4 ø
LOS	A	774	900	855	825
	B	903	1050	1000	965
	C	1010	1200	1140	1100
	D	1161	1350	1275	1225
	E	1290	1500	1425	1375

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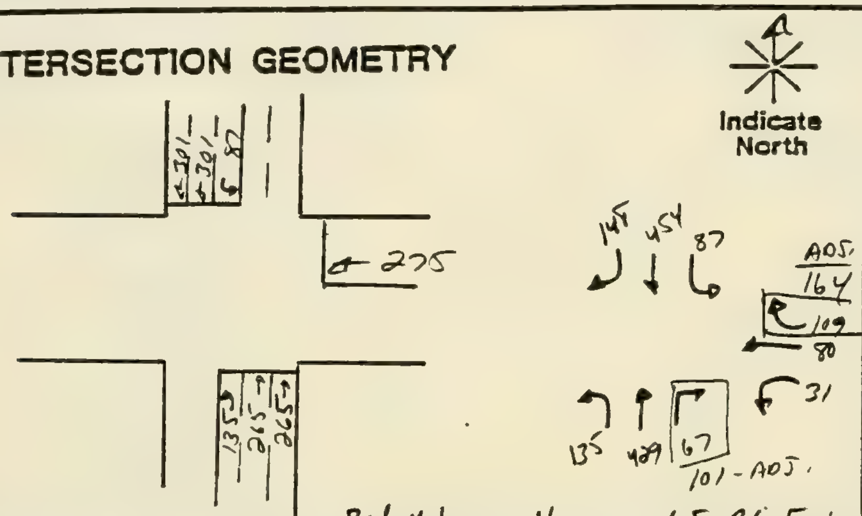
INTERSECTION Atlantic Av / State St.
ALT. 1984 YEAR 1984 PERIOD AM
CALCULATED BY RP DATE 10/23 SHEET ___ OF ___
CHECKED BY ______ DATE ______ JOB NO. 0923

INTERSECTION GEOMETRY



Ped Volumes - Heavy - 1.5 Adj Factor

Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3 Ø   o----o Ped Ø

A	B	C	D	E
265 + 87	275	135		
CLV=	CLV=	CLV=	CLV=	CLV=

Σ CLV 762
V/C .53
LOS A

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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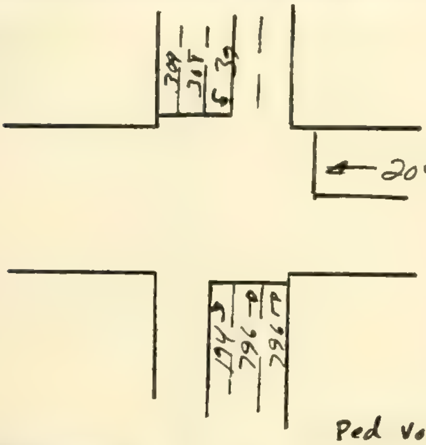
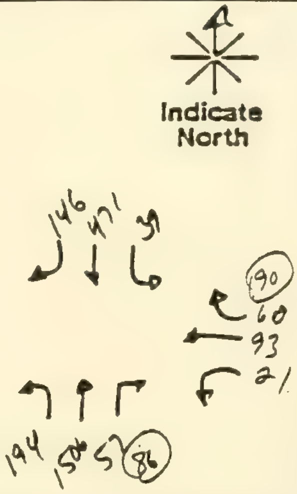
INTERSECTION Atlantic Av / State St.
ALT. Existing YEAR 1984 PERIOD PM
CALCULATED BY RB DATE 10/23/84 SHEET ___ OF ___
CHECKED BY ________ DATE ________ JOB NO. 0923

INTERSECTION GEOMETRY



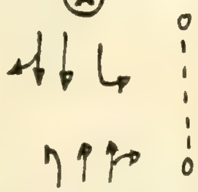
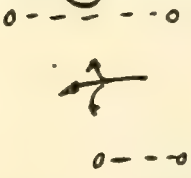
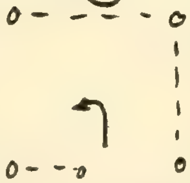


Ped Volumes - Heavy - 1.5 Adj Factor

Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3 ∅ o----o Ped ∅

A	B	C	D	E
				
796 +39	204	194		
CLV=	CLV=	CLV=	CLV=	CLV=

Σ CLV 1233
V/C .87
LOS D

CRITERIA (vph)		2 ∅	3 ∅	4 ∅
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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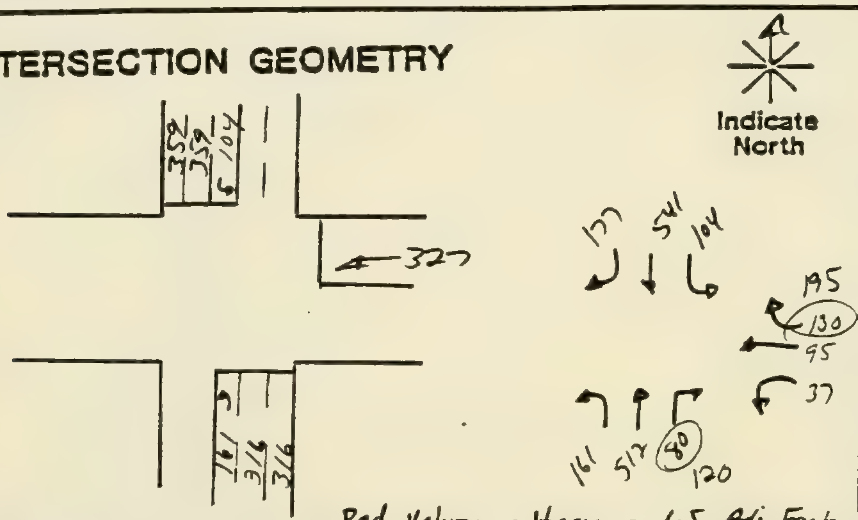
INTERSECTION Atlantic Av/State St.
ALT. No Build YEAR 1990 PERIOD Am
CALCULATED BY ____ DATE ____ SHEET ___ OF ___
CHECKED BY ____ DATE ____ JOB NO. 0923

INTERSECTION GEOMETRY



Ped Volumes - Heavy - 1.5 Adj Factor

Left Turn Check

	Approach 1	Approach 2	Approach 3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3 ∅

o----o Ped ∅

A	B	C	D	E
316 + 104 = 420	327	161		
CLV= 420	CLV= 327	CLV= 161	CLV=	CLV=

Σ CLV 908

V/C .64

LOS B

CRITERIA (vph)		2 ∅	3 ∅	4 ∅
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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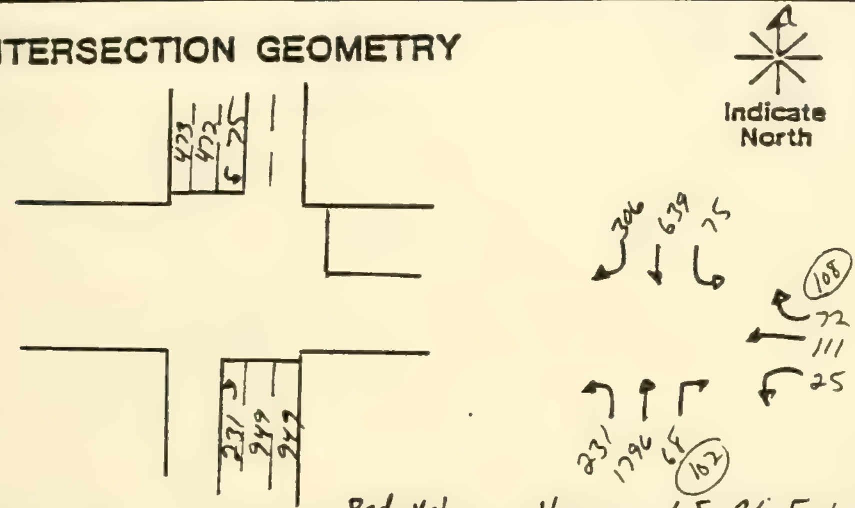
INTERSECTION Atlantic Av / State St.
ALT. No Build YEAR 1990 PERIOD pm
CALCULATED BY RB DATE 10/23/84 SHEET ___ OF ___
CHECKED BY ________ DATE ________ JOB NO. 0923

INTERSECTION GEOMETRY



Ped Volumes - Heavy - 1.5 Adj Factor

Left Turn Check

	Approach 1	Approach 2	Approach 3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3 ∅ 0- - - -0 Ped ∅

A	B	C	D	E
75+949	244	231		
CLV=	CLV=	CLV=	CLV=	CLV=

Σ CLV 1499
V/C 1.05
LOS E

CRITERIA (vph)		2 ∅	3 ∅	4 ∅
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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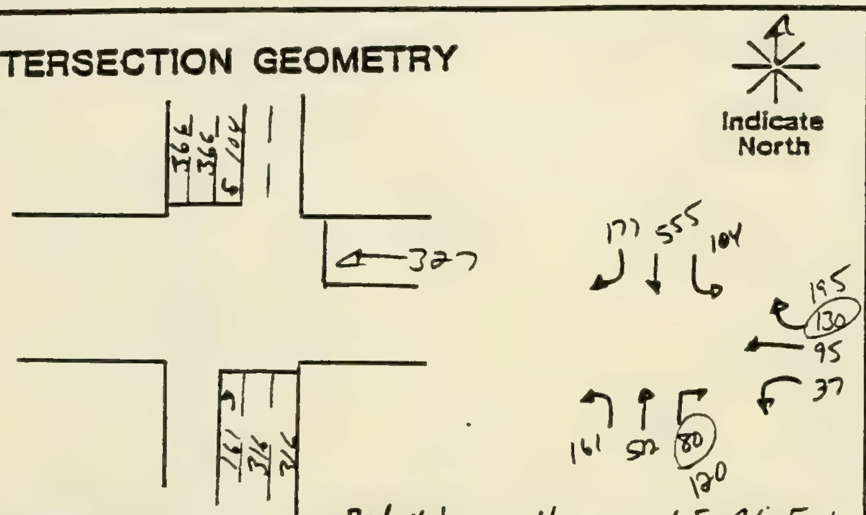
INTERSECTION Atlantic Av / State St.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY RB DATE 10/23/89 SHEET ___ OF ___
CHECKED BY ________ DATE ________ JOB NO. 0923

INTERSECTION GEOMETRY

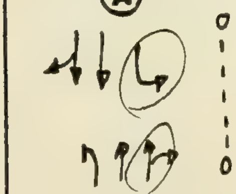
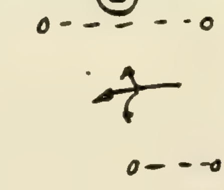
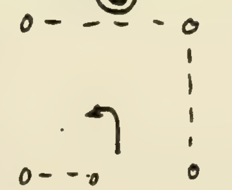


Ped Volumes - Heavy - 1.5 Adj Factor

Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 3 ∅ o----o Ped ∅

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
				
316 + 104	327	161		
CLV=	CLV=	CLV=	CLV=	CLV=

Σ CLV 908
V/C .64
LOS B

CRITERIA (vph)		2 ∅	3 ∅	4 ∅
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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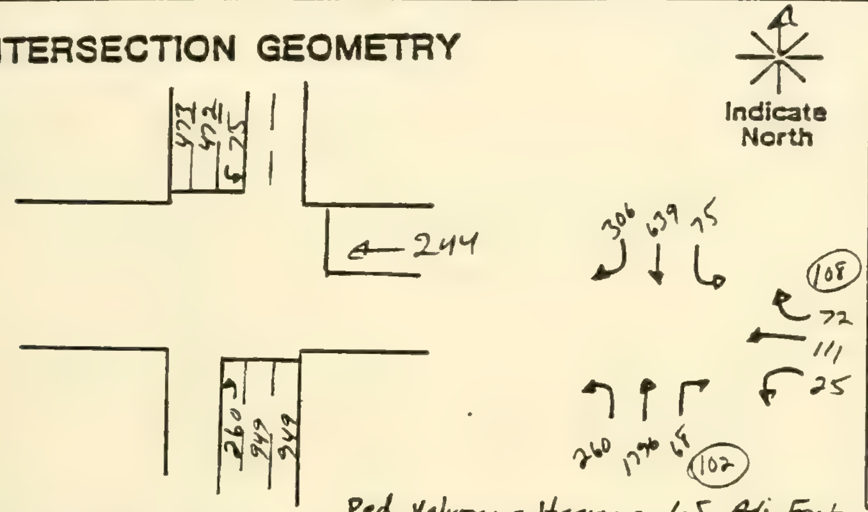
INTERSECTION Atlantic Av / State St.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY RB DATE 10/23/84 SHEET ___ OF ___
CHECKED BY ________ DATE ________ JOB NO. 0923

INTERSECTION GEOMETRY

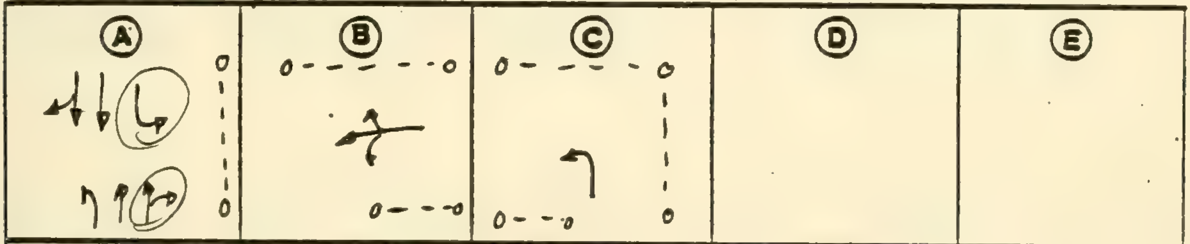


Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

Ped Volumes - Heavy - 1.5 Adj Factor

PHASING 3 ∅ o----o Ped ∅



A	B	C	D	E
949 + 75	244	260		
CLV=	CLV=	CLV=	CLV=	CLV=

Σ CLV 1525
V/C 1.07
LOS E

CRITERIA (vph)		2 ∅	3 ∅	4 ∅
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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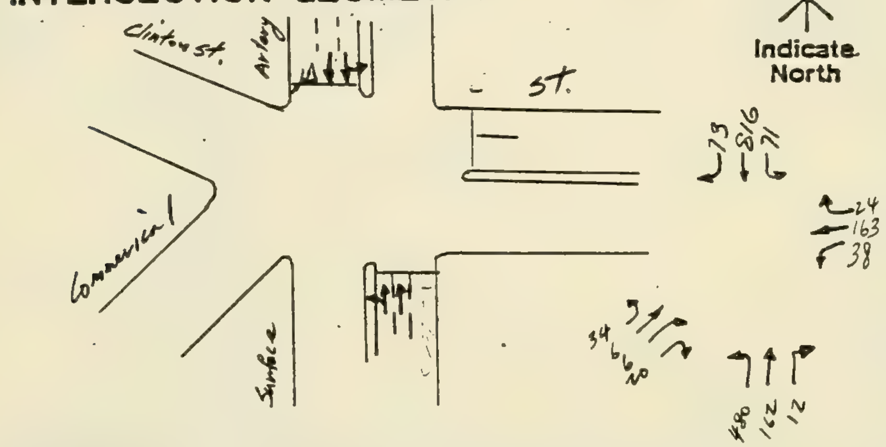
INTERSECTION Surface Artery/Clinton St./Commercial St.
ALT. Existing YEAR 1984 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE 8/10/84 JOB NO. 8923

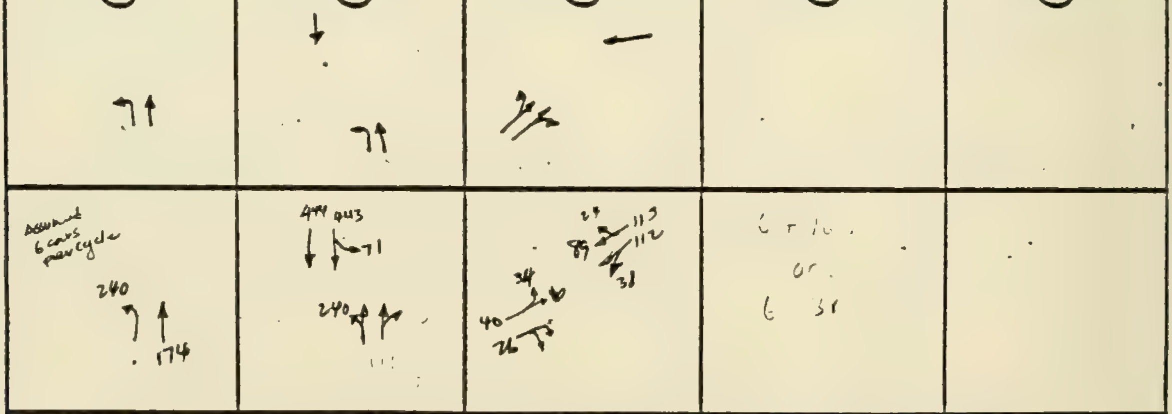
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2 φ w/ADV



A	B	C	D	E
CLV= 240	CLV= 443+240	CLV= 113+281	CLV=	CLV=

ΣCLV 1042 ADJ 1303

V/C 0.81

LOS D

20% Reduction for Peds

CRITERIA (vph)		ADJ	2 ø		3 ø	4 ø
LOS	A	720	900		855	825
	B	840	1050	1025	1000	965
	C	960	1200		1140	1100
	D	1080	1350		1275	1225
	E	1200	1500	1463	1425	1375

VH

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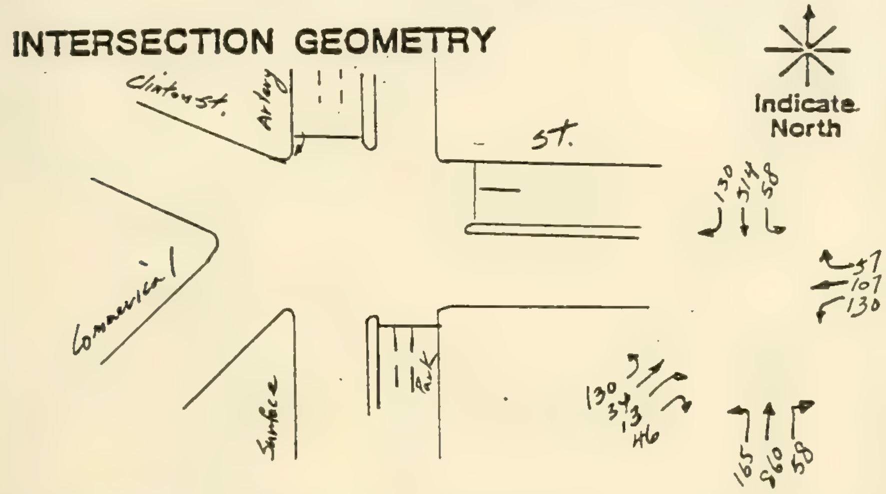
INTERSECTION Surface Artery / Clinton St. / Commercial St.
ALT. Existing YEAR 1984 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE 7/11 JOB NO. 8923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2 Ø

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
165, 165, 330, 330	315, 199, 59, 0, 211, 212	57, 90, 147, 147, 130, 130, 34, 164, 59		
CLV= 330	CLV= 315	CLV= 147+34	CLV=	CLV=

Assume only 1/2 LT's in Adv since mixed traffic } carryover = 423

Σ CLV 826 ADJ 1007
V/C 0.67
LOS B
18% Reduction for Peds

CRITERIA (vph)		Ap	2 Ø		3 Ø	4 Ø
LOS	A	735	900		855	825
	B	861	1050	1025	1000	965
	C	984	1200		1140	1100
	D	1107	1350		1275	1225
	E	1230	1500	1463	1425	1375

VH
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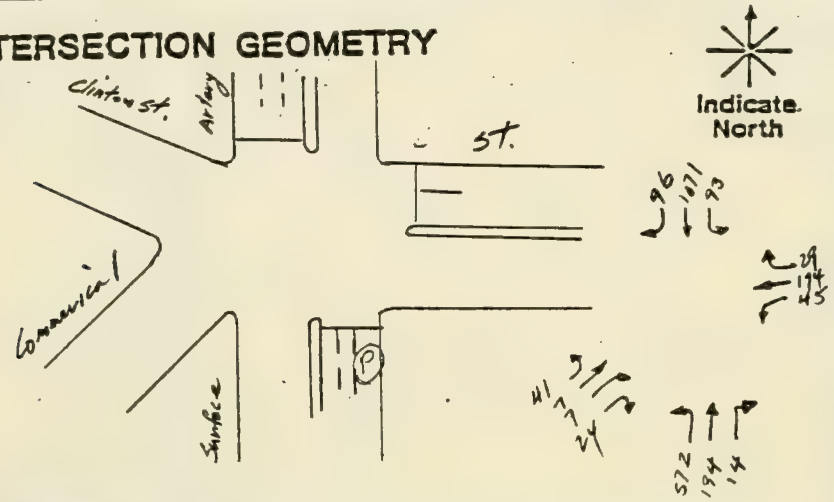
617 / 482-1870

INTERSECTION *Surface Artery / Clinton St. / Commercial St.*
ALT. *No-Build* YEAR *1990* PERIOD *AM*
CALCULATED BY *BG* DATE ______ SHEET ___ OF ___
CHECKED BY *RB* DATE *8/10/84* JOB NO. *8923*

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				-
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING *2 ø*

A	B	C	D	E
Assumed 6 cars per cycle 240 240	582 582 93 332 0	29 134 134 45 47 41 31		
CLV= *240*	CLV= *582+332*	CLV= *134+47*	CLV=	CLV=

Carry over = 332 0

Σ CLV *1295* *ADJ 1618*

V/C *1.08*

LOS *E*

20% Reduction for Peds

CRITERIA (vph)		*ADJ*	2 ø	3 ø	4 ø
LOS	A	*720*	900	855	825
	B	*840*	1050	1000	965
	C	*900*	1200	1140	1100
	D	*1050*	1350	1275	1225
	E	*1200*	1500	1425	1375

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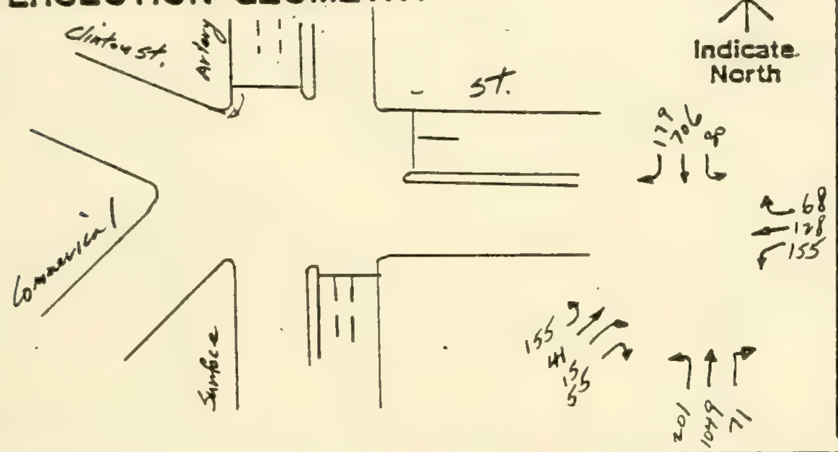
INTERSECTION Surface Artery / Clinton St. / Commercial St.
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE ____ SHEET ___ OF ___
CHECKED BY ____ DATE ____ JOB NO. 8923

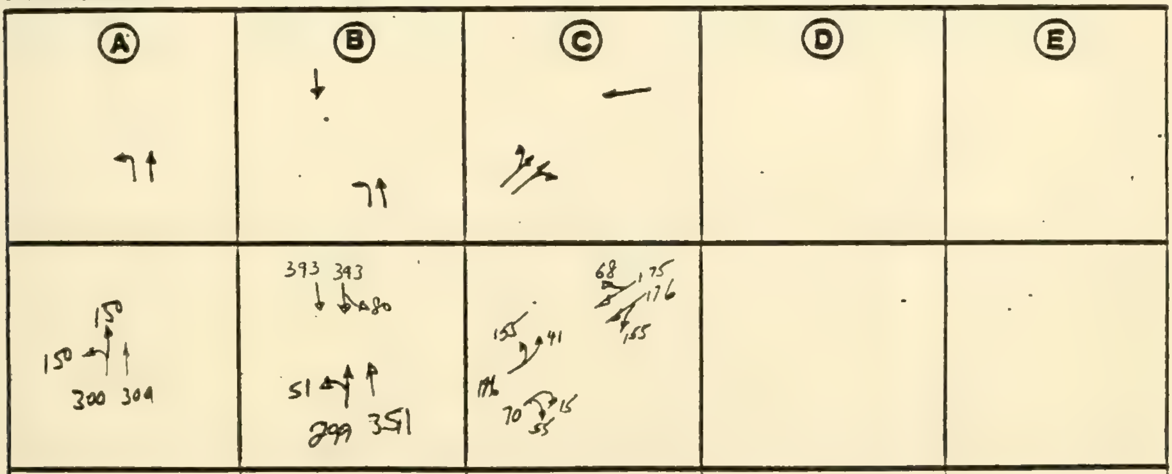
INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING



A	B	C	D	E
CLV= 300	CLV= 393 + 51	CLV= 176+41	CLV=	CLV=

USE ADV of 300
Assume 1/2 LT CARLeOVER = 51 599

opp vol = 706 × .75 = 530 LT FAC = 2.0
⇒

Σ CLV 961 ADJ 1172
V/C 0.78
LOS C

18% Reduction for Peds

CRITERIA (vph)		ADJ	2 Ø	3 Ø	4 Ø
LOS	A	738	900	855	825
	B	861	1050	1000	965
	C	984	1200	1140	1100
	D	1107	1350	1275	1225
	E	1230	1500	1425	1375

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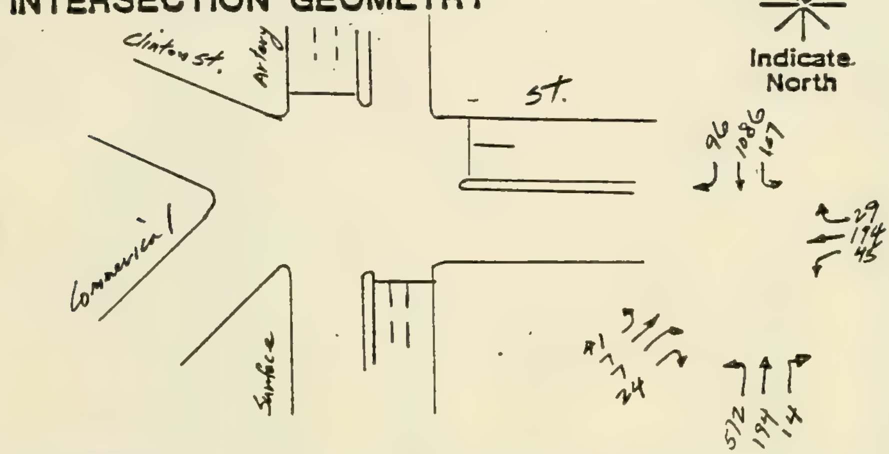
INTERSECTION Surface Artery / Clinton St. / Commercial St.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY AR DATE 5/13 JOB NO. 8923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			–
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING

A	B	C	D	E
240, 208	597, 596, 107, 332, 0, 14	29, 134, 154, 45, 41, 7, 48, 31, 7		
CLV= 240	CLV= 597+332	CLV= 134+7	CLV=	CLV=

ADJ

Σ CLV 1310 1638

V/C 1.09

LOS E

30% reduction for Peds

CRITERIA (vph)		ADT	2 Ø	3 Ø	4 Ø
LOS	A	720	900	855	825
	B	840	1050	1000	965
	C	960	1200	1140	1100
	D	1050	1350	1275	1225
	E	1200	1500	1425	1375

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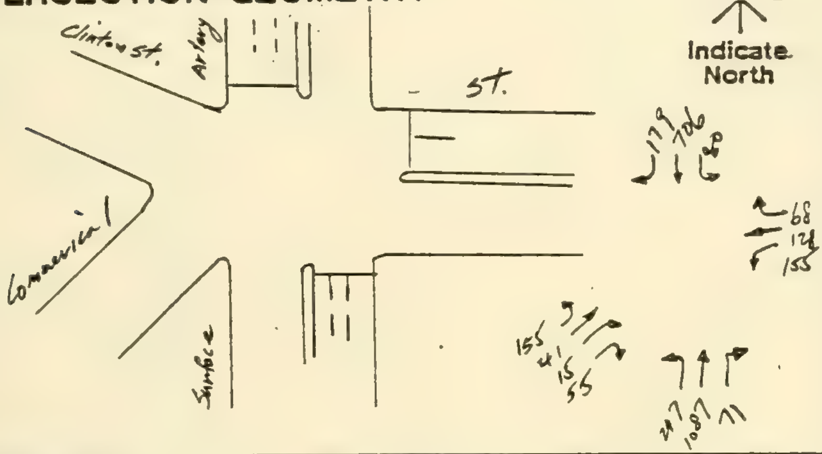
INTERSECTION Surface Artery / Clinton St. / Commercial St.
ALT. Build YEAR ~ 1990 PERIOD PM
CALCULATED BY BGT DATE SHEET OF
CHECKED BY KJS DATE JOB NO. 8923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING

A	B	C	D	E
150 150 300 300	393 393 80 97 71 319 416	68 175 176 155 41 16 70 70		
CLV= 300	CLV= 416+80	CLV= 176+41	CLV=	CLV=

LT ADV + ½ TH ; CARRYOVER = 637↑ 97↰ OPP VOL = 393 x 1.5 = 590 < 600 USE 2.0 LT FACTOR

Σ CLV 1013 ADJ 1235

V/C 0.83

LOS D

18% Reduction for Peds

CRITERIA (vph)		ACT	2 Ø	3 Ø	4 Ø
LOS	A	738	900	855	825
	B	861	1050	1000	965
	C	984	1200	1140	1100
	D	1107	1350	1275	1225
	E	~~1250~~ 1230	1500	1425	1375

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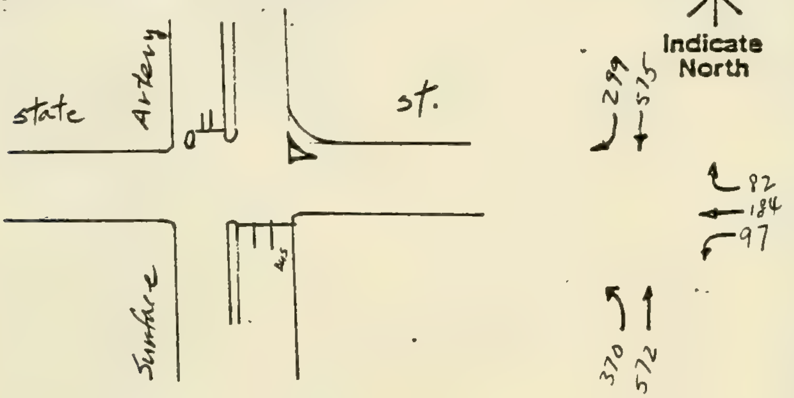
INTERSECTION Surface Artery / State St.
ALT. Existing YEAR 1984 PERIOD AM
CALCULATED BY BG DATE SHEET OF
CHECKED BY AB DATE JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2φ

A	B	C	D	E
299 / 287 288 / 0 / 370 / 370 572	82 / 141 / 140 / 97			
CLV= 288 + 370	CLV= 141	CLV=	CLV=	CLV=

Σ CLV 799
V/C 0.53
LOS A

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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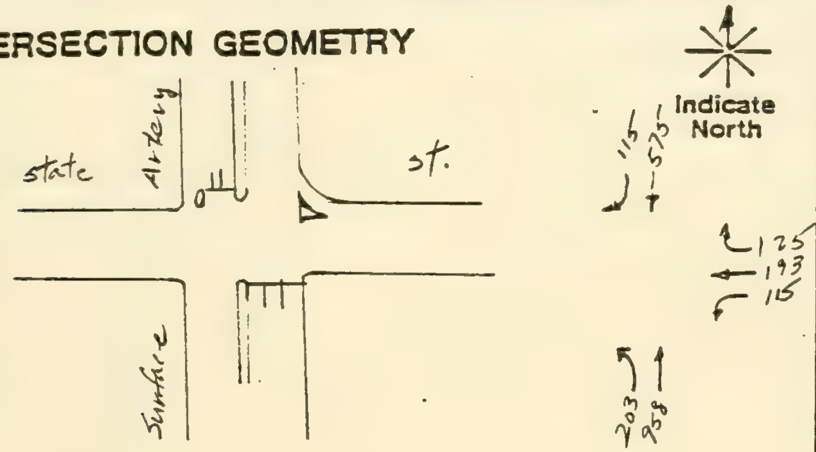
INTERSECTION Surface Artery/State St.
ALT. Existing YEAR 1984 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY RB DATE JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	Approach 2	Approach 3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2Ø

A	B	C	D	E
115, 287, 288, 203, 479, 479	125, 154, 154, 115			
CLV= 682	CLV= 154	CLV=	CLV=	CLV=

0

Σ CLV 836
V/C 0.55
LOS A

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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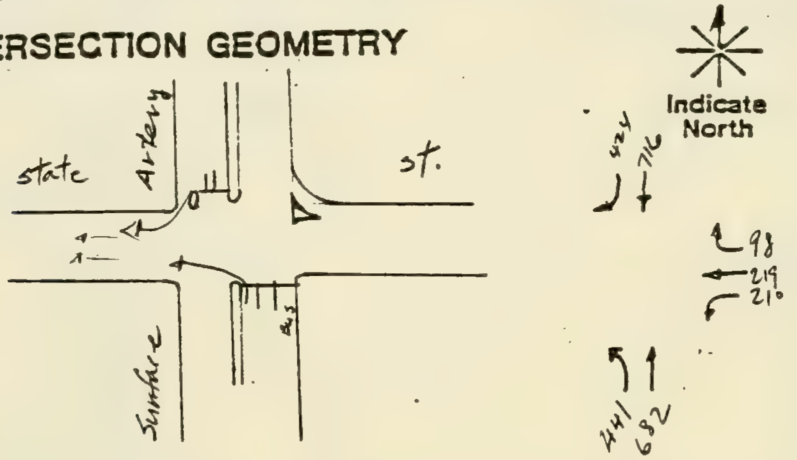
INTERSECTION Surface Artery / State St.
ALT. No-Build YEAR 1990 PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE 9/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2φ

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
↓ ↑	←			
424 358 358 441 0 682	98 215 214 210			
CLV= 441+358	CLV= 215	CLV=	CLV=	CLV=

Σ CLV 1014
V/C 0.68
LOS B

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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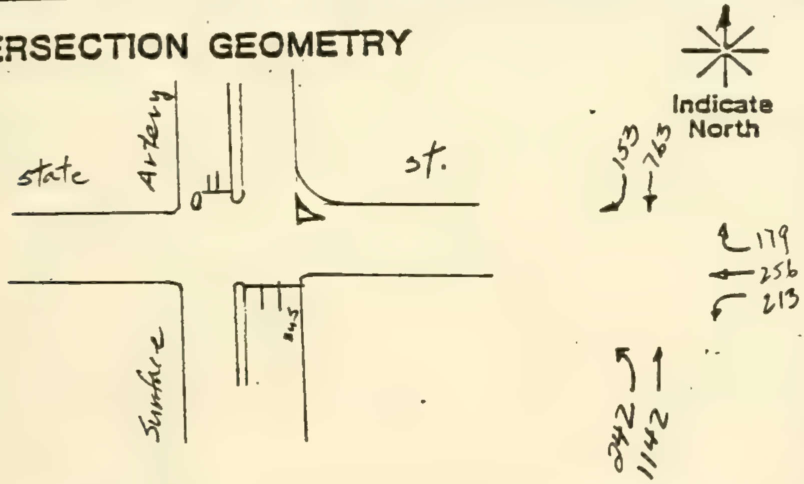
INTERSECTION Surface Artery / State St.
ALT. No Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE ____ SHEET ___ OF ___
CHECKED BY KF DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3	4
a. Number of change intervals per hour				
b. Left turn capacity on change interval, in vph				
c. G/C Ratio				
d. Opposing volume in vph				
e. Left turn capacity on green, in vph				
f. Left turn capacity in vph (b + e)				–
g. Left turn volume in vph				
h. Is volume > capacity (g > f)?				

PHASING 2φ

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
↓ ↑	←			
153, 382, 381, 242, 329, 571, 813	179, 235, 234, 213			
CLV= 813	CLV= 235	CLV=	CLV=	CLV=

OPP VOL = 382 x 1.5 = 573 LT FAC = 2.0

Σ CLV 1048
V/C 0.70
LOS C

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

VH

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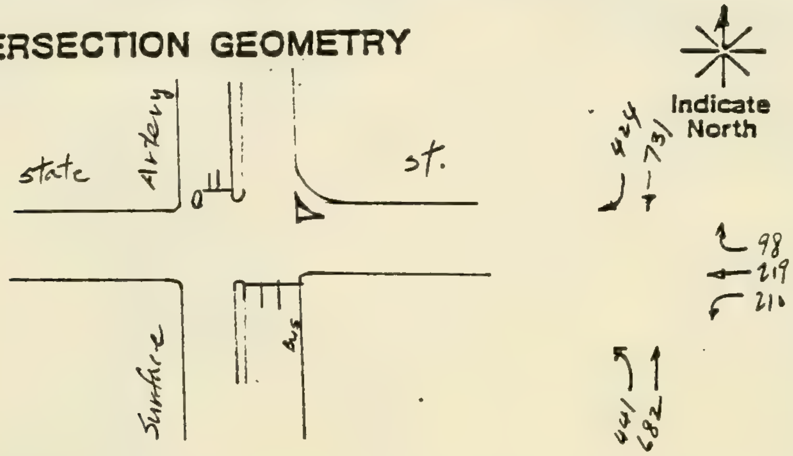
INTERSECTION Surface Artery / State St.
ALT. Build YEAR 1990 PERIOD AM
CALCULATED BY OG DATE ____ SHEET ___ OF ___
CHECKED BY RB DATE 8/13 JOB NO. 0923

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2φ

(A)	(B)	(C)	(D)	(E)
↓ ↑	←			
424 366 365 0 441 682	98 215 214 210			
CLV= 365 + 441	CLV= 215	CLV=	CLV=	CLV=

Σ CLV 1021

V/C 0.68

LOS B

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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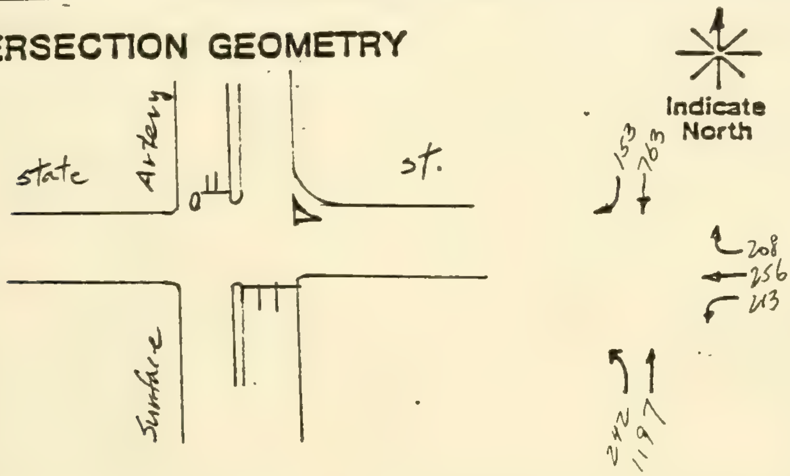
INTERSECTION Surface Artery / State St.
ALT. Build YEAR 1990 PERIOD PM
CALCULATED BY BG DATE SHEET OF
CHECKED BY KB DATE JOB NO. 0723

INTERSECTION GEOMETRY



Left Turn Check

	Approach 1	2	3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2Ø

A	B	C	D	E
381 382 153 242 598 841	208 235 234 213			
CLV= 841	CLV= 235	CLV=	CLV=	CLV=

OPP VOL = 382 × 1.5 = 573 LT FAC = 2.0

Σ CLV 1076

V/C .72

LOS C

CRITERIA (vph)		2 Ø	3 Ø	4 Ø
LOS	A	900	855	825
	B	1050	1000	965
	C	1200	1140	1100
	D	1350	1275	1225
	E	1500	1425	1375

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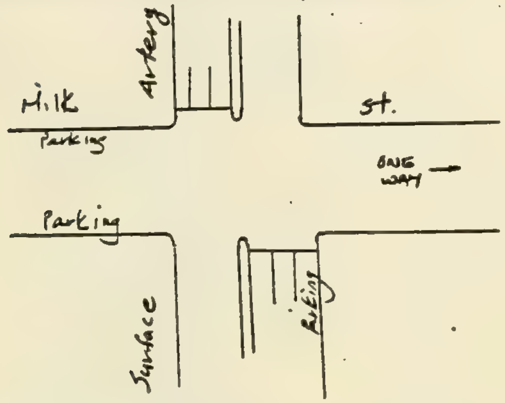
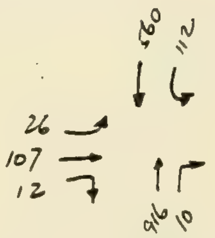
INTERSECTION Surface Artery / Milk St.
ALT. Existing YEAR 1984 PERIOD AM
CALCULATED BY BG DATE ______ SHEET ___ OF ___
CHECKED BY RB DATE ______ JOB NO. 0923

INTERSECTION GEOMETRY



Indicate North



Left Turn Check

	Approach 1	Approach 2	Approach 3
a. Number of change intervals per hour			
b. Left turn capacity on change interval, in vph			
c. G/C Ratio			
d. Opposing volume in vph			
e. Left turn capacity on green, in vph			
f. Left turn capacity in vph (b + e)			
g. Left turn volume in vph			
h. Is volume > capacity (g > f)?			

PHASING 2 ∅

A	B	C	D	E
504 168 112 10 463 463	26 145 107 12			
CLV= 463+112	CLV= 145	CLV=	CLV=	CLV=

OPP VOL = 463 × 1.5 = 695 LT FAC = 4.0

ADJ. 867

Σ CLV 720

V/C 0.58

LOS A

77 % Reduction for Peds

CRITERIA (vph)		ADJ	2 ∅	3 ∅	4 ∅
LOS	A	747	900	855	825
	B	872	1050	1000	965
	C	996	1200	1140	1100
	D	1121	1350	1275	1225
	E	1245	1500	1425	1375

BOSTON TRAFFIC AND PARKING DEPARTMENT — AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION ATLANTIC AVE. AND MILK STREET　　　DATE 7/20/77

INTERSECTION Nº 2006　　　DATE FIRST IN SERVICE 5/23/74

TIMING FOR AUTOMATIC OPERATION

													Cycle Flash
NORMAL	Without Ped.		32	4	0	0	7	3	4	13	3	4	70
	With Ped.		18	4	7	7	7	3	4	13	3	4	
7:00 AM to 9:30 AM	Without Ped.		49	4	0	0	9	3	4	14	3	4	90
	With Ped.		34	4	7	8	9	3	4	14	3	4	
3:30 PM to 6:30 PM	Without Ped.		54	4	0	0	13	3	4	15	3	4	100
	With Ped.		40	4	7	7	13	3	4	15	3	4	
	Without Ped.												
	With Ped.												
	Without Ped.												
	With Ped.												
	Without Ped.												
	With Ped.												
Atlantic Ave.		N.B	G	Y	R	R	R	R	R	R	R	R	Y
6A-7B Atlantic Ave.		S.B	G	Y	R	R	R	R	R	R	R	R	Y
7A Atlantic Ave.		S.B	VA	Y	R	R	R	R	R	R	R	R	Y
Milk Street		W.B	R	R	R	R	LA-RA	LA-RA	Y	R	R	R	R
Milk Street		E.B	R	R	R	R	R	R	R	G	G	Y	R
C.W. 2F-7F			W	W	W	W	W	FDW	FDW	DW	DW	DW	-
C.W. 2E-3E;5E-6F			DW	DW	W	W	W	W	W	W	FDW	FDW	-
C.W. All others			DW	DW	W	FDW	DW	DW	DW	DW	DW	DW	-

Post	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1			CONTROL BOX				
2		A	R	Y	RA	LA	
		E	DW	W			
		F	DW	W			
3	X	B	R	Y	G		
		E	DW	W			
		F	DW	W			
4	X	A	R	Y	G	(MAST)	
		B	R	Y	G		
		E	DW	W			
		F	DW	W			
5	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
6	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
7	X	A	R	Y	VA		
		B	R	Y	G		
		C	R	Y	RA	LA	
		E	DW	W			
		F	DW	W			
7	5	21	53	Total for Intersection			

Automatic Operation from 6:00 AM to 2:00 AM = 20 hours per day.

Pedestrian Signal Operation from ________ to ________ = hours per day.

Remote P.B. Actuation from ________ to ________ = hours per day.

Flasher Operation from 2:00 AM to 6:00 AM = 4 hours per day.

Timer-Type Crouse-Hinds Flasher-Type Crouse-Hin

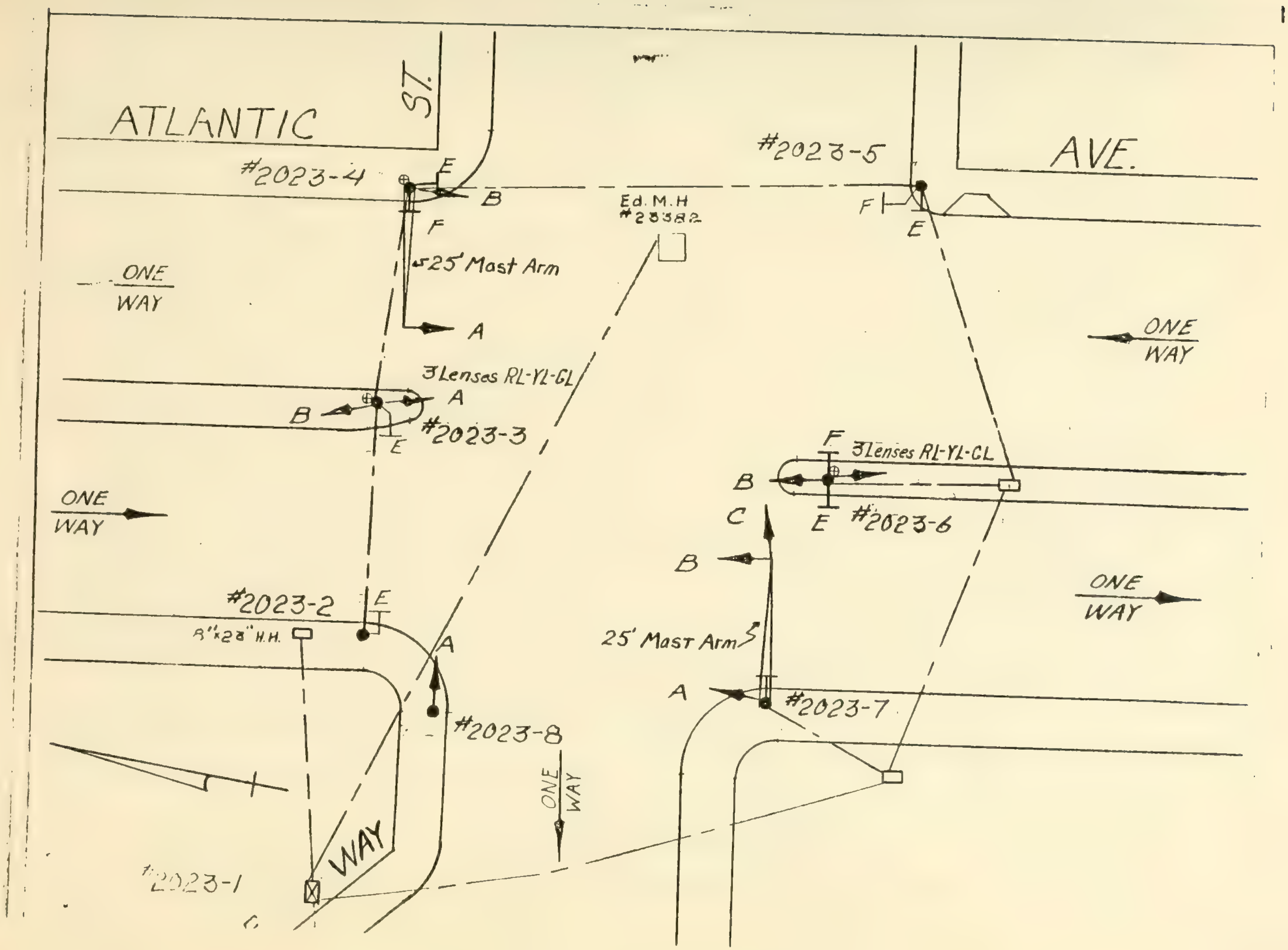
Coordinated ☒ Interconnected ☒ Non-Interconnected ☐

Master at Clinton St. & J.F.F. Expressway Surface Road

OFFSETS	%
D1	
D2	
D3	

MASSACHUSETTS PERMIT Number	Date

REMARKS



ATLANTIC
ST.
AVE.
#2023-4
#2023-5
Ed. M.H #28382
25' Mast Arm
ONE WAY
3 Lenses RL-YL-GL
#2023-3
ONE WAY
3 Lenses RL-YL-GL
#2023-6
ONE WAY
#2023-2
8"x28" H.H.
25' Mast Arm
#2023-7
#2023-8
ONE WAY
WAY
#2023-1

BOSTON TRAFFIC AND PARKING DEPARTMENT—AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION Atlantic Ave.,J.F.F.Surface Rd. and State St. DATE 8/15/77

INTERSECTION Nº 2023, 2024 DATE FIRST IN SERVICE Installed by State

TIMING FOR AUTOMATIC OPERATION

																		Cycle Flash
NORMAL	Without Ped.						18	7	4	7	5	4	15	4	2	4		[illegible]
	With Ped.																	
7 AM to 9:30 AM	Without Ped.						37	7	4	7	5	4	16	4	2	4		[illegible]
	With Ped.																	
3:30 PM to 6:30 PM	Without Ped.			6/3	/83		48 ~~34~~	7	4	7	5	4	15 ~~29~~	4	2	4		100
	With Ped.																	
	Without Ped.																	
	With Ped.																	
	Without Ped.		*To be 'G' in non-actuated cycle															
	With Ped.		**To be 'DW' in non-actuated cycle															
	Without Ped.		°To be FDW in non-actuated cycle															
	With Ped.																	
Northbound Atlantic Ave. N.B.		3A-6A					RL	RL	RL	RL	RL	RL	GL	YL	RL	RL		YL
Atlantic Ave. S.B.		4A-4B					G	G	Y	R	R	R	*R	*R	*R	*R		Y
Atlantic Ave.		3C-6B-7A-7B					G	G	Y	R	R	R	R	R	R	R		Y
State St.		3B-4C-7C					R	R	R	G	G	Y	R	R	R	R		R
State St.@Surface Rd.							R	R	R	G	G	G	G	G	G	Y		R
J.F.F.Surface Rd.							G	G	Y	R	R	R	R	R	R	R		Y
C.W. 6E-7E							DW	DW	DW	DW	DW	DW	W	FDW	FDW	FDW		-
C.W. 5F-6F							DW	DW	DW	W	FDW	FDW	DW	DW	DW	DW		-
C.W. 4E-5E							W	FDW	FDW	DW	DW	DW	W	W	W	W		-
C.W. 3F-4F							DW	DW	DW	W	°W	°W	**W	**FDW	**FDW	**FDW		-
C.W. 2E-3E							DW	DW	DW	W	W	W	W	FDW	FDW	FDW		-

Post	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1	CB-	Atlantic Ave. and State St.					
2		E	DW	W			
3	X	A	RL	YL	GL		
		B	R	Y	G		
		C	R	Y	G		
		E/F	DW/DW	W/W			
4	X	A	R	Y	G		
		B	R	Y	G		
		C	R	Y	G		
		E/F	DW/DW	W/W			
5	X	E	DW	W			
		F	DW	W			
6		A	RL	YL	GL		
		B	R	Y	G		
		E	DW	W			
		F	DW	W			
7		A	R	Y	G		
		B	R	Y	G		
		C	R	Y	G		
		E	DW	W			
1	CB-	(junction) JFF. Surface and State					
2		A	R	Y	G		
		*B	R	Y	G		
3		*A	R	Y	G		
4		A	R	Y	G		
5		A	R	Y	G		
		B	R	Y	G	added 7/2/76	
6		A	R	Y	G		
		*B	R	Y	G		
13	3	29	77	Total for Intersection			

Automatic Operation from ______ to ______ = 24 hours per day.

Pedestrian Signal Operation from ______ to ______ = hours per day.

Remote P.B. Actuation from ______ to ______ = hours per day.

Flasher Operation from ______ to ______ = 0 hours per day.

Timer-Type Crouse-Hinds Flasher-Type Crouse-Hin

Coordinated ☒ Interconnected ☒ Non-Interconnected ☐

Master at Clinton St. and J.F.F. Expressway Surface Rd.

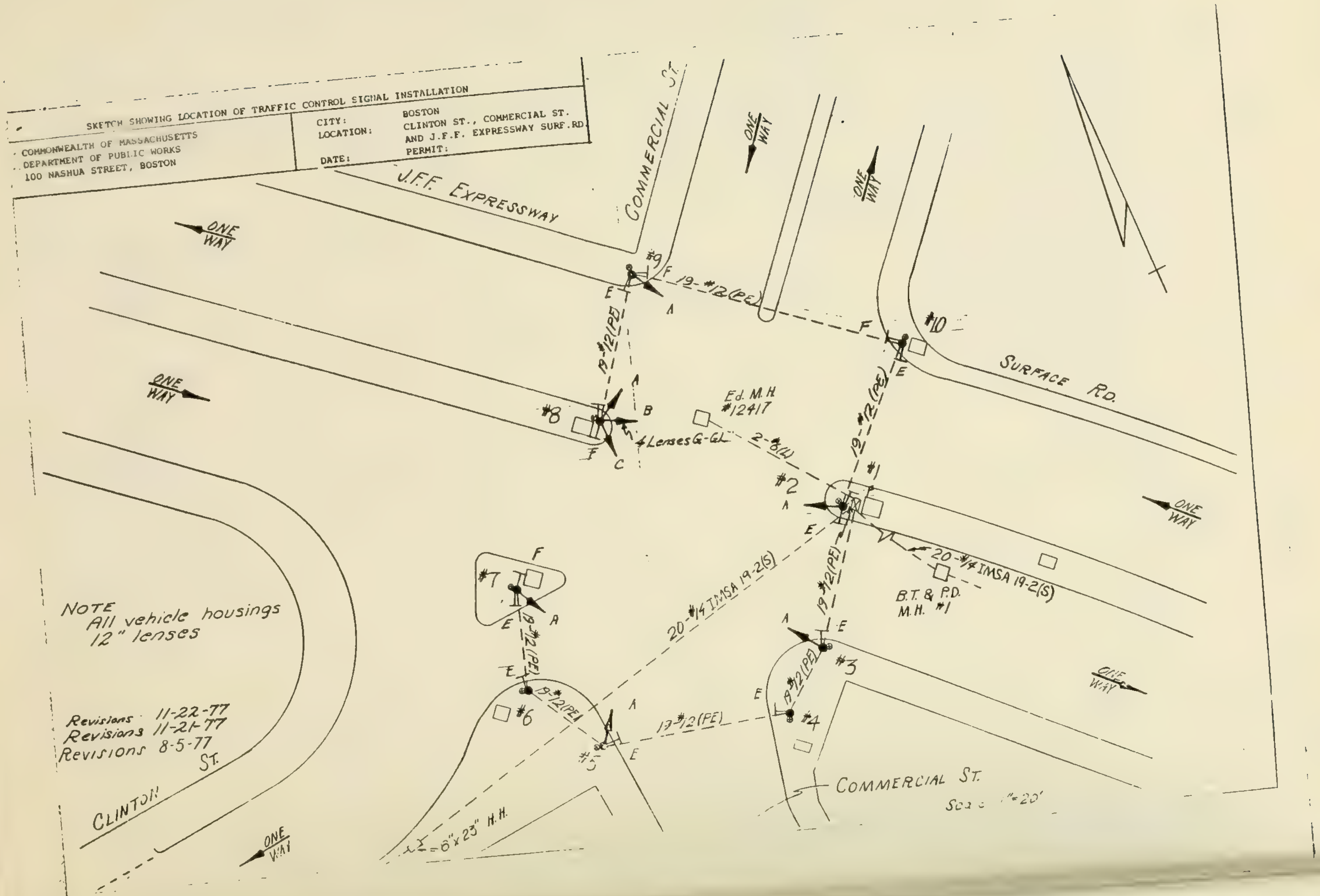
OFFSETS	%
D1	
D2	
D3	

MASSACHUSETTS PERMIT Number	Date

REMARKS

*Optically programmed

All vehicle lenses 12" at Atl. & State



SKETCH SHOWING LOCATION OF TRAFFIC CONTROL SIGNAL INSTALLATION
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS
100 NASHUA STREET, BOSTON
CITY: BOSTON
LOCATION: CLINTON ST., COMMERCIAL ST. AND J.F.F. EXPRESSWAY SURF. RD.
PERMIT:
DATE:
J.F.F. EXPRESSWAY
COMMERCIAL ST.
SURFACE RD.
COMMERCIAL ST.
CLINTON ST.
ONE WAY
#1
#2
#3
#4
#5
#6
#7
#8
#9
#10
19-#12(PE)
2-#8(L)
4 Lenses G-GL
Ed. M.H. #12417
20-#14 IMSA 19-2(S)
B.T. & P.D. M.H. #1
13-#12(PE)
NOTE All vehicle housings 12" lenses
Revisions 11-22-77
Revisions 11-21-77
Revisions 8-5-77

BOSTON TRAFFIC DEPARTMENT — AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION Clinton St., Commercial St., and J.F.F. Surface Rd. DATE 8-5-77

INT. No. 64 DATE FIRST IN SERVICE 5-25-76 CURRENT SUPPLY 115 VAC

Post	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1		Control	Box				Except Sat. & Sun.
	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
3	X	A	R	Y	G		
		E	DW	W			
4	X	E	DW	W			
5	X	A	R	Y	G		
		E	DW	W			
6	X	E	DW	W			
7	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
8	X	A	R	Y	G		
		B	R	Y	- G	GL	
		C	R	Y	G		
		E	DW	W			
		F	DW	W			
9	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
10	X	E	DW	W			
		F	DW	W			
			ALL vehicle lenses				12"
10	9	22	53	Total for Intersection			

TIMING FOR AUTOMATIC OPERATION

		7 3 4 3										Cycle	Flash
NORMAL	Without Ped.	8 4	4	35 39	4	0	0	10	5	4		70	
	With Ped.	5 4	4	11 21	4	7	11	10	5	4		70	
7 a.m. to 9:30a.m.	Without Ped.	6 8	4	45 53	4	0	0	12	5	4		90	
	With Ped.	6 8	4	27 35	4	7	11	12	5	4		90	
3:30p.m. to 6:30pm	Without Ped.	26	4	56 62	4	0	0	15	5	4		100	
	With Ped.	26	4	32 44	4	7	11	15	5	4		100	
SurfaceRdN.B(8B)		G-GL	G	G	Y	R	R	R	R	R			Y
SurfaceRdN.B(9A)		G	G	G	Y	R	R	R	R	R			Y
SurfaceRd S.B.		R	R	G	Y	R	R	R	R	R			Y
Commercial ST		R	R	R	R	R	R	G	G	Y			R
C.W.7F-8F;2F-10E*		DW	DW	DW	DW	W	W	W	FDW	FDW			-
C.W.ALL OTHERS*		DW	DW	DW	DW	W	FDW	DW	DW	DW			-
				*off 11p.m. to 7a.m.									

Automatic Operation from :30 6a.m. to 2a.m. = 20 19 1/2 hours per day 11/12/82

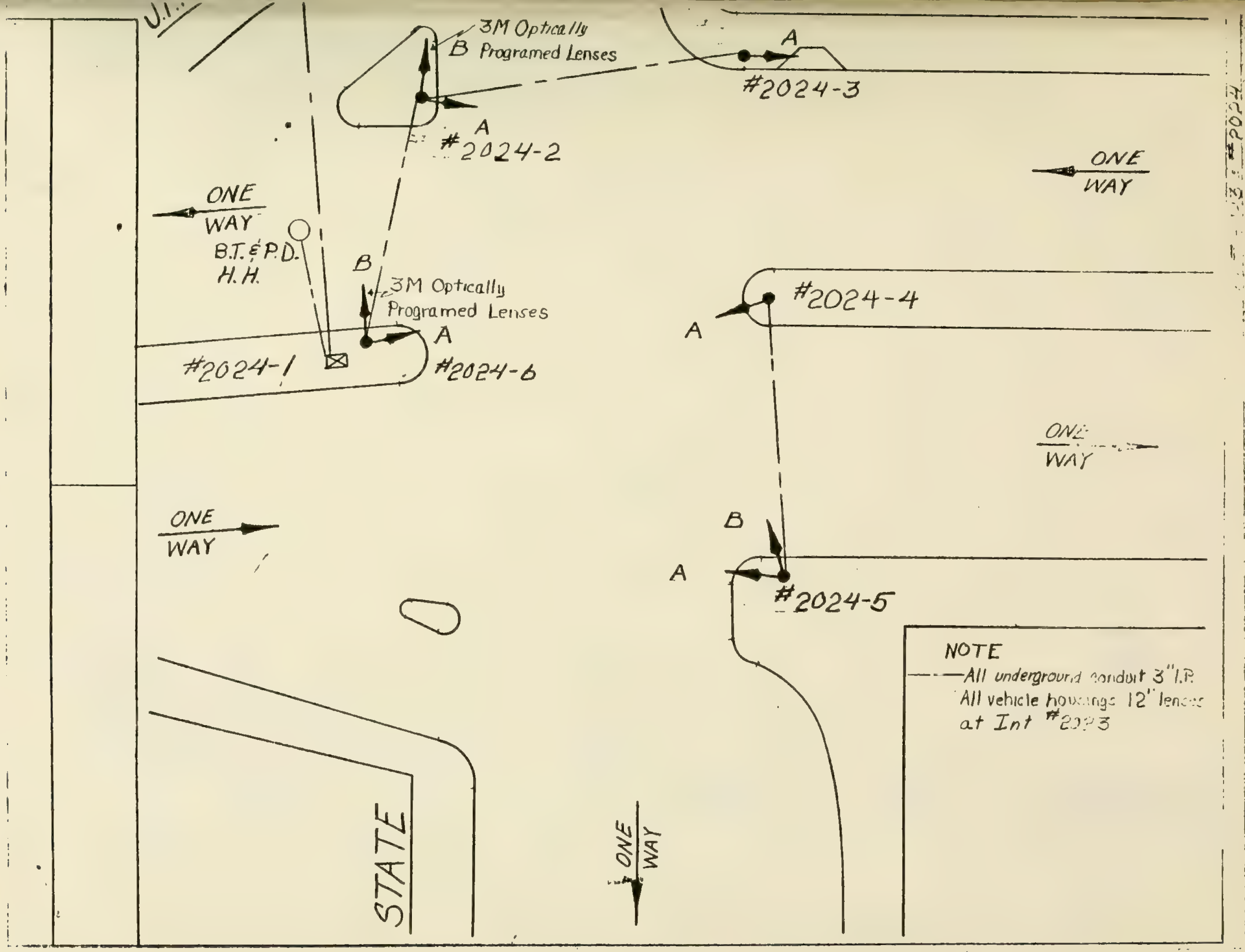
Flasher Operation from 2a.m. to :30 6a.m. = 4 1/2 hours per day

Timer—Type Crouse-Hinds Flasher—Type Crouse-Hinds

Coordinated ☒ Interconnected ☒ Non-interconnected ☐

Offset ______ Master at This Location

MASSACHUSETTS PERMIT No.	Date	REMARKS
		See W.O. 334 - 11/15/77 for Timing Change on 11/21-22/77


3M Optically
B Programed Lenses
A
#2024-3
A
#2024-2
ONE
WAY
ONE
WAY
B.T.&P.D.
H.H.
B
3M Optically
Programed Lenses
A
#2024-1
#2024-6
#2024-4
A
ONE
WAY
ONE
WAY
B
A
#2024-5
NOTE
All underground conduit 3" I.P.
All vehicle housings 12" lenses
at Int #2023
STATE
ONE
WAY

BOSTON TRAFFIC AND PARKING DEPARTMENT — AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION Atlantic Ave., J.F.F.Surface Rd. and State St. DATE 8/15/77

INTERSECTION Nº 2023, 2024 DATE FIRST IN SERVICE Installed by State

TIMING FOR AUTOMATIC OPERATION

																				Cycle Flash
NORMAL	Without Ped.						18	7	4	7	5	4	15	4	2	4				70
	With Ped.																			
AM to	Without Ped						37	7	4	7	5	4	16	4	2	4				90
:30 AM	With Ped.																			
:30 PM to	Without Ped.			6/8	/83		48 ~~34~~	7	4	7	5	4	15 ~~29~~	4	2	4				100
:30 PM	With Ped.																			
	Without Ped.																			
	With Ped.																			
	Without Ped.		*To be 'G' in non-actuated cycle																	
	With Ped.		**To be 'DW' in non-actuated cycle																	
	Without Ped.		°To be FDW in non-actuated cycle																	
	With Ped.																			
Northbound Atlantic Ave.			3A-6A				RL	RL	RL	RL	RL	RL	GL	YL	RL	RL				YL
Atlantic Ave.			4A-4B				G	G	Y	R	R	R	*R	*R	*R	*R				Y
Atlantic Ave.			3C-6B-7A-7B				G	G	Y	R	R	R	R	R	R	R				Y
State St.			3B-4C-7C				R	R	R	G	G	Y	R	R	R	R				R
State St.@Surface Rd.							R	R	R	G	G	G	G	G	G	Y				R
J.F.F.Surface Rd.							G	G	Y	R	R	R	R	R	R	R				Y
C.W. 6E-7E							DW	DW	DW	DW	DW	DW	W	FDW	FDW	FDW				-
C.W. 5F-6E							DW	DW	DW	W	FDW	FDW	DW	DW	DW	DW				-
C.W. 4E-5E							W	FDW	FDW	DW	DW	DW	W	W	W	W				-
C.W. 3F-4F							DW	DW	DW	W	°W	°W	**W	**FDW	**FDW	**FDW				-
C.W. 2E-3E							DW	DW	DW	W	W	W	W	FDW	FDW	FDW				-

ost	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1	CB-	Atlantic Ave. and State St.					
2		E	DW	W			
3	X	A	RL	YL	GL		
		B	R	Y	G		
		C	R.	Y	G		
		E/F	DW/DW	W/W			
4	X	A	R	Y	G		
		B	R	Y	G		
		C	R	Y	G		
		E/F	DW/DW	W/W			
5	X	E	DW	W			
		F	DW	W			
6		A	RL	YL	GL		
		B	R	Y	G		
		E	DW	W			
		F	DW	W			
7		A	R	Y	G		
		B	R	Y	G		
		C	R	Y	G		
		E	DW	W			
1	CB-	(junction) JFF. Surface and State					
2		A	R	Y	G		
		*B	R	Y	G		
3		*A	R	Y	G		
4		A	R	Y	G		
5		A	R	Y	G		
		B	R	Y	G	added 7/2/76	
6		A	R	Y	G		
		*B	R	Y	G		
13	3	29	77	Total for Intersection			

Automatic Operation from ________ to ________ = 24 hours per day.

Pedestrian Signal Operation from ________ to ________ = hours per day.

Remote P.B. Actuation from ________ to ________ = hours per day.

Flasher Operation from ________ to ________ = 0 hours per day.

Timer-Type Crouse-Hinds Flasher-Type Crouse-Hinc

Coordinated ☒ Interconnected ☒ Non-Interconnected ☐

Master at Clinton St. and J.F.F. Expressway Surface Rd.

OFFSETS	%
D1	
D2	
D3	

MASSACHUSETTS PERMIT	
Number	Date

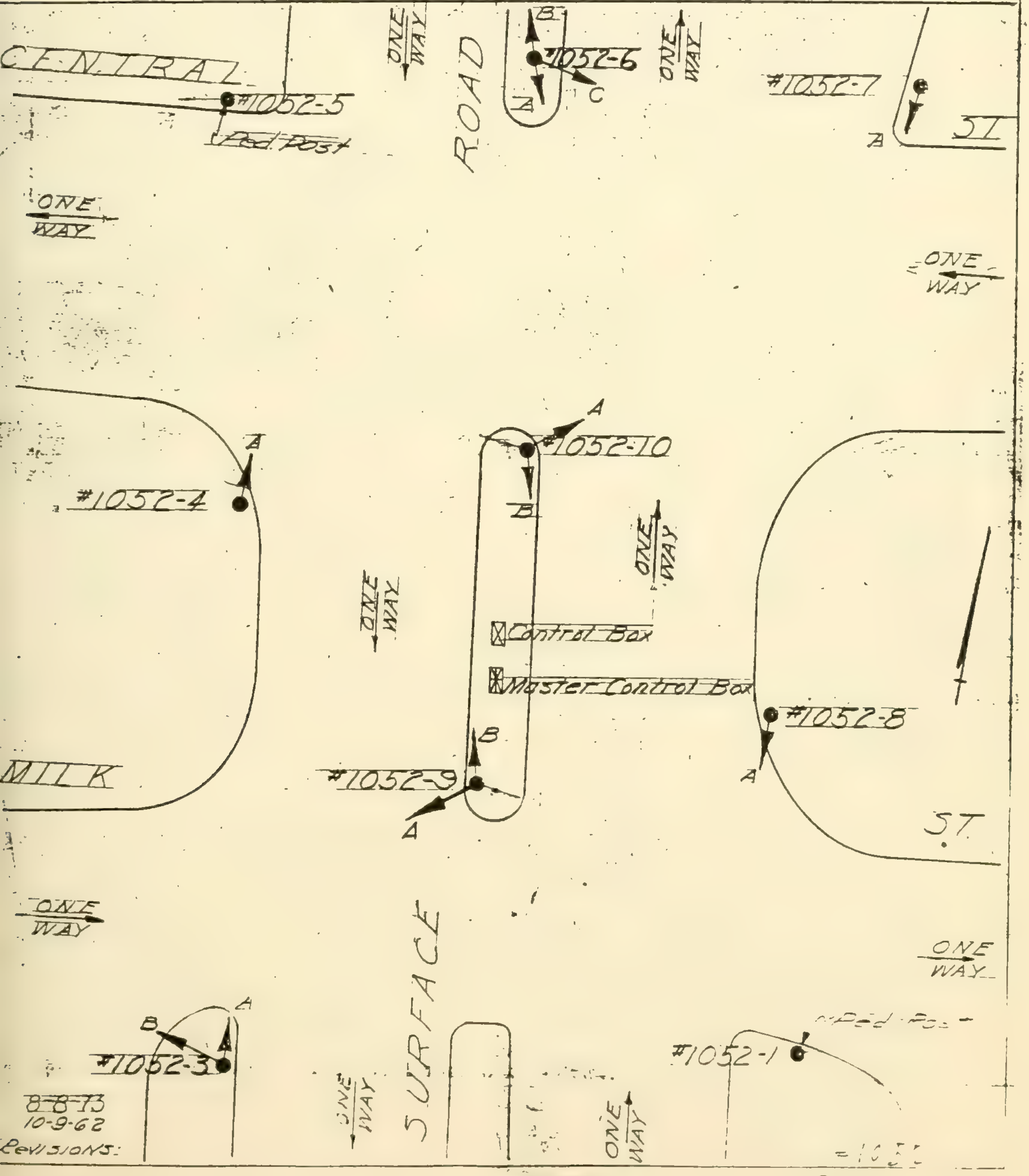
REMARKS

*Optically programmed

All vehicle lenses 12" at Atl. & State

SKETCH SHOWING LOCATION OF TRAFFIC CONTROL SIGNAL INSTALLATION

COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS 100 NASHUA STREET, BOSTON	CITY BOSTON LOCATION: Central St., John F. Fitzgerald Expressway (Surface Road) & Milk St. DATE PERMIT



BOSTON TRAFFIC DEPARTMENT — AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION J.F.F. Expressway Surface Rd. and Milk St. DATE 7/7/77

INT. No. 1052 DATE FIRST IN SERVICE Prior to 1958 CURRENT SUPPLY 115 V.A.L.

Post	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1			Control Box				
2	X	A	R	Y	G		
		E	DW	W			
3	X	E	DW	W			
		F	DW	W			
4	X	A	R	Y	G		
		B	R	Y	G		
		E	DW	W			
		F	DW	W			
5	X	A	R	Y	G		
		E	DW	W			
(		A	R	Y	G		
		B	R	Y	G	(mast)	
				Reset %			
				D1	[illegible]		
				D2	84		
				D3	84		
5	4	12	30	Total for Intersection			

TIMING FOR AUTOMATIC OPERATION											Cycle	Flas
NORMAL	Without Ped.		41	4	0	0	17	4	4		70	
	With Ped.		26	4	7	8	17	4	4		70	
D2	Without Ped.		60	4	0	0	18	4	4		90	
	With Ped.		45	4	7	8	18	4	4		90	
D3	Without Ped.		66	4	0	0	22	4	4		100	
	With Ped.		51	4	7	8	22	4	4		100	
Surface Rd.			G	Y	R	R	R	R	R			Y
Milk St.			R	R	R	R	G	G	Y			R
C.W. 3F-4F			DW	DW	W	W	W	FDW	FDW			-
C.W. 2E-3E;4E-5E			DW	DW	W	FDW	DW	DW	DW			-

Automatic Operation from SEE MASTER = hours per day

Flasher Operation from to = hours per day

Timer—Type Crouse Hinds Flasher—Type Crouse Hinds

Coordinated ☒ Interconnected ☒ Non-interconnected ☐

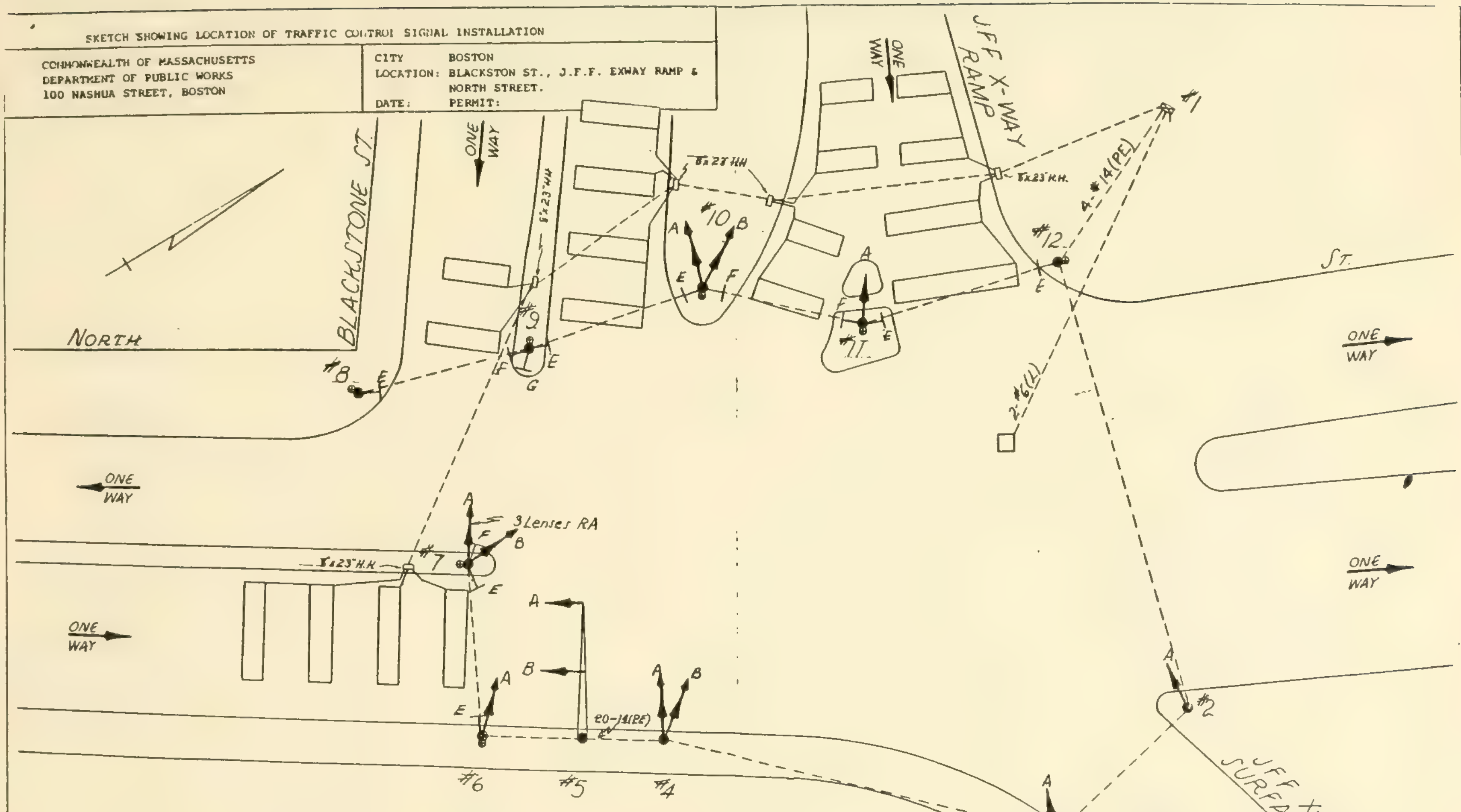
Offset Master at Clinton St. & J.F.F. Surface Rd.

MASSACHUSETTS PERMIT No.	Date	REMARKS
		on flash 7/7/77 to 7/20/77

SKETCH SHOWING LOCATION OF TRAFFIC CONTROL SIGNAL INSTALLATION

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS
100 NASHUA STREET, BOSTON

CITY BOSTON
LOCATION: BLACKSTON ST., J.F.F. EXWAY RAMP & NORTH STREET.
DATE: PERMIT:



NOTE
19-#12(?) between all signal posts except as noted.
2-#14(S) between each #1 and #3
#6 bonding wire between all signal posts
All Vehicle housings 12" lenses
Vehicle housings #4A, 4B, 6A, 7A, 7B, 10A, and 10E [illegible] 3M
Optically Programmed lenses

BOSTON TRAFFIC AND PARKING DEPARTMENT—AUTOMATIC TRAFFIC SIGNALS

Has been Flashing for last year and a half

OPERATION SCHEDULE

LOCATION Blackstone St., J.F. Fitzgerald Expressway Ramp RF and North St. DATE 8/28/78

INTERSECTION Nº 1115 DATE FIRST IN SERVICE 5/25/76

TIMING FOR AUTOMATIC OPERATION

											Cycle Flash
NORMAL	Without Ped.										
	With Ped.										
	Without Ped.										
	With Ped.										
	Without Ped.										
	With Ped.										
	Without Ped.										
	With Ped.										
	Without Ped.										
	With Ped.										
	Without Ped.										
	With Ped.										
Initial		11			7			7			
Extension		1			1			1			
Maximum #1		60			35			30			
Other Int.		10/6	4	1	12/6	3	1	8/6	3.5	1.5	
Maximum #2 3pm - 6pm		38			32			23			
J.F.F. Expressway Ramp RF		G	Y	R	R	R	R	R	R	R	R
Blackstone St. N. Rdwy.		R	R	R	G	Y	R	R	R	R	R
North Street		R	R	R	R	R	R	G	Y	R	Y
Blackstone St. S. Rdwy.		R	R	R	R	R	R	RA	Y	R	R
C.W. 8E-9F; 6E-7E		W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	-
C.W. 10F-11F; 11E-12E		DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	-
C.W. 7F-9G; 9E-10E		DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	-

ost	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1			Control Box				
2		A	R	Y	G		
3		A	R	Y	G		
4		*A	R	Y	G		
		*B	R	Y	G		
5		A	R	Y	G		
		B	R	Y	G		
6	X	*A	R	Y	G		
		E	DW	W			
7	X	*A	R	Y	RA		
		*B	R	Y	G		
		E	DW	W			
		F	DW	W			
8	X	E	DW	W			
9	X	E	DW	W			
		F	DW	W			
		G	DW	W			
0	X	*A	R	Y	G		
		*B	R	Y	G		
		E	DW	W			
		F	DW	W			
1	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
2	X	E	DW	W			
		*Optically programmed					
		All vehicle lenses 12"					
12	7	24	60	Total for Intersection			

Automatic Operation from ________ to ________ = 24 hours per day.

Pedestrian Signal Operation from ________ to ________ = hours per day.

Remote P.B. Actuation from ________ to ________ = hours per day.

Flasher Operation from ________ to ________ = hours per day.

Timer-Type ________ Flasher-Type ________

Coordinated ☐ Interconnected ☐ Non-Interconnect ☒

Master at ________

OFFSETS	
	%

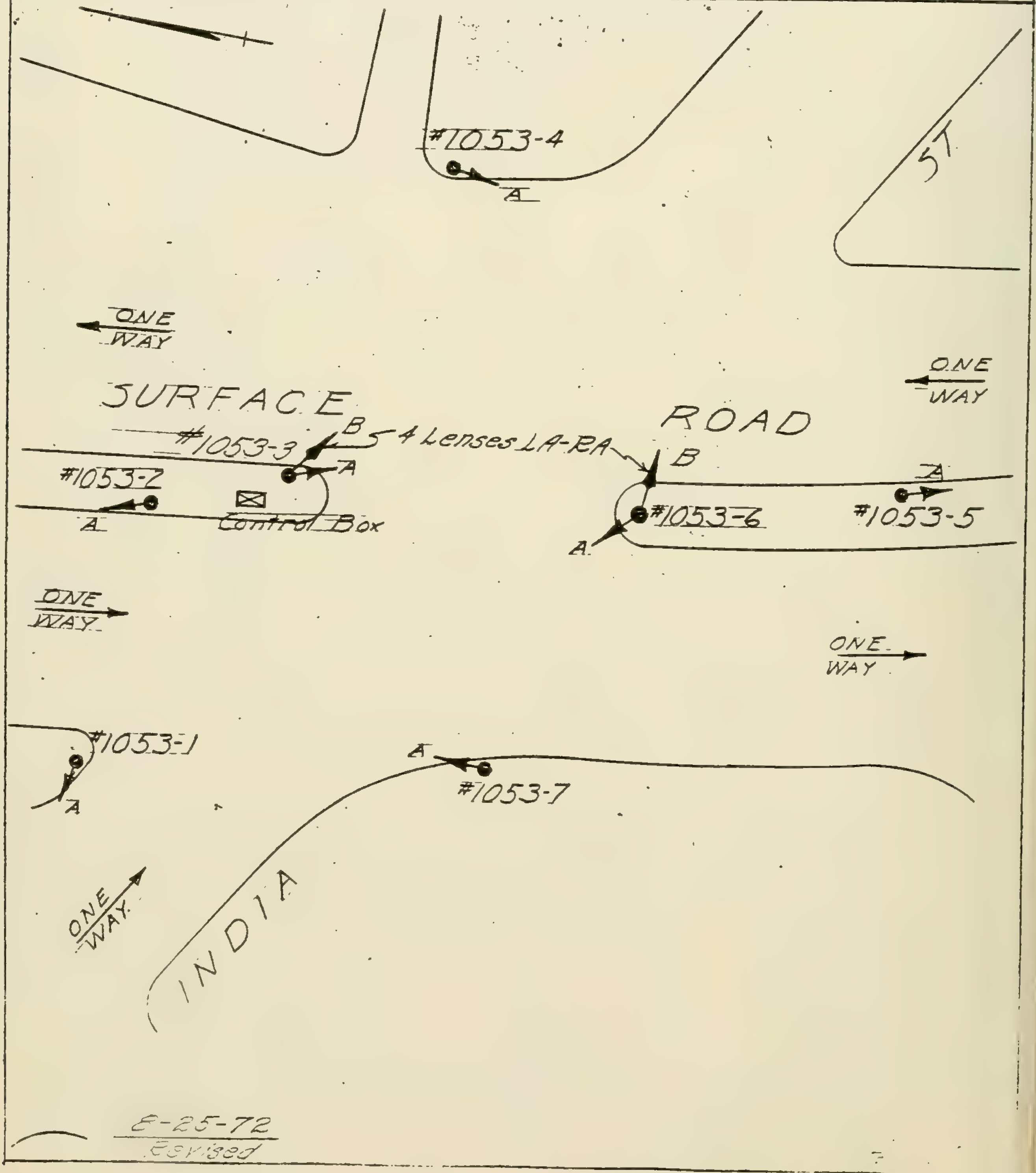
MASSACHUSETTS PERMIT	
Number	Date
AB-035	
-1914	5-2-84

REMARKS

Blackstone local Rdwy. loop amp set for "pulse" operation

SKETCH SHOWING LOCATION OF FLASHING SIGNAL INSTALLATION

COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS 100 NASHUA STREET, BOSTON	CITY BOSTON LOCATION: India St. & John F. Fitzgerald (Surface Road) DATE PERMIT



BOSTON TRAFFIC DEPARTMENT — AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION INDIA ST. and JOHN F. FITZGERALD EXPRESSWAY (Surface Road) DATE June 10, 1958

INT. No. 1053 DATE FIRST IN SERVICE Installed by State CURRENT SUPPLY 115vA.C.

Post	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
Control		Box					
1		A	R	Y	G		
2		A	R	Y	G		
3		A	R	Y	G		
4		~~A~~	~~R~~	~~Y~~	~~G~~	5/1/73	
3 5	→	B A	R R	Y Y	LA G	RA	8/25/72
6		~~B A~~	~~R R~~	~~Y Y~~	~~LA G~~	~~RA~~	11/17/72
7		A	R	Y	G		
7		9 8	29 21	Total for Intersection			

TIMING FOR AUTOMATIC OPERATION

						Cycle	Flash
NORMAL	Without Ped.	41	5	40	4	90	
	With Ped.						
	Without Ped.						
	With Ped.						
	Without Ped.						
	With Ped.						
Surface Road		*G	Y	R	R		Y
India St. EB		R	R	G	Y	R	~~Y~~
India St. W.B		R	R	LA-RA	Y		R

Automatic Operation from 6 a.m. to 2 a.m. = 20 hours per day

Flasher Operation from 2 a.m. to 6 a.m. = 4 hours per day

Timer—Type G. E. Flasher—Type G. E.

Coordinated X Interconnected X Non-interconnected ☐

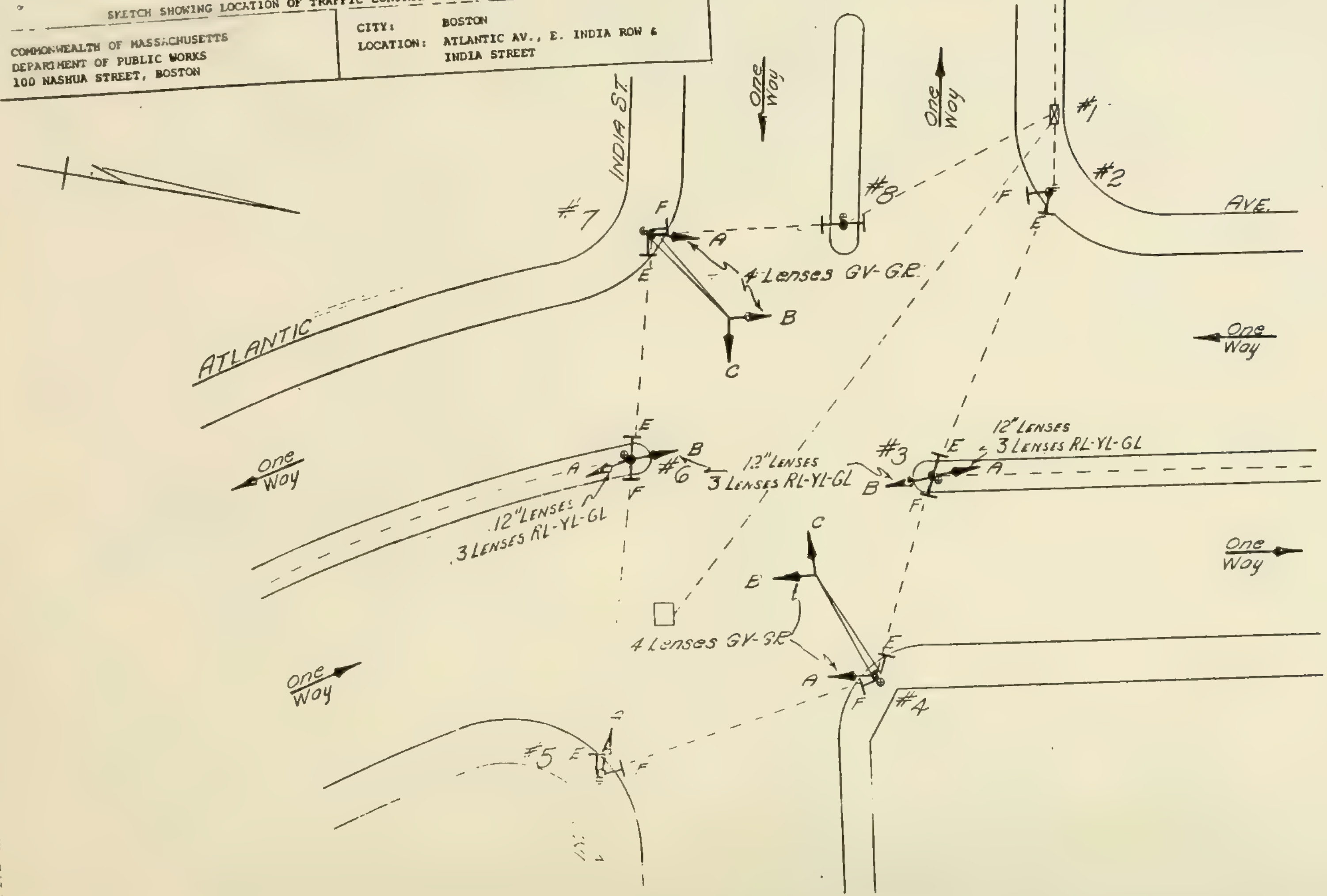
Offset * 10 sec. Separate Master at Central St., Expressway & Milk St.

MASSACHUSETTS PERMIT No.	Date	REMARKS
#1837	6-10-58	Signals reverted to State control from 5/1/60 to 2/[illegible]

SKETCH SHOWING LOCATION OF TRAFFIC CONTROL SIGNAL

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS
100 NASHUA STREET, BOSTON

CITY: BOSTON
LOCATION: ATLANTIC AV., E. INDIA ROW & INDIA STREET



5-8-7

BOSTON TRAFFIC AND PARKING DEPARTMENT—AUTOMATIC TRAFFIC SIGNALS

OPERATION SCHEDULE

LOCATION Atlantic Avenue, East India Row & West India Street DATE 11/9/76

INTERSECTION Nº 2007 DATE FIRST IN SERVICE 5/16/74

TIMING FOR AUTOMATIC OPERATION

																					Cycle Flash
NORMAL	Without Ped	29	3	4	0	0	7	3	4	13	3	4									70
	With Ped.	15	3	4	7	7	7	3	4	13	3	4									
:00 am to	Without Ped.	46	3	4	0	0	9	3	4	14	3	4									90
:30 am	With Ped	32	3	4	7	7	9	3	4	14	3	4									
:30 pm to	Without Ped	51	3	4	0	0	13	3	4	15	3	4									100
:30 pm	With Ped.	37	3	4	7	7	13	3	4	15	3	4									
	Without Ped.																				
	With Ped.																				
	Without Ped																				
	With Ped.																				
	Without Ped.																				
	With Ped.																				
tlantic Ave.		GV-GR	GV-GR	Y	R	R	R	R	R	R	R	R									Y
TLANTIC AVE. LT		RL	RL	RL	RL	RL	RL	RL	RL	GL	GL	YL									YL
AST INDIA ROW		R	R	R	R	R	G	G	Y	R	R	R									R
WEST INDIA STREET		R	R	R	R	R	G	G	Y	R	R	R									R
W 7F-8E		W	*FDW	*FDW	W	FDW	DW	DW	DW	W	W	W									-
W 5E-6F,2E-3E		DW	DW	DW	W	W	W	FDW	FDW	DW	DW	DW									-
W 3F-4E,6E-7E		DW	DW	DW	W	FDW	DW	DW	DW	W	FDW	FDW									-
W 2F-8F,4F-5F		DW	DW	DW	W	FDW	DW	DW	DW	DW	DW	DW									-

Post	Ped. P.B.	Face	Top Lens	2nd Lens	3rd Lens	4th Lens	5th Lens
1		CONTROL BOX					
2	X	E	DW	W			
		F	DW	W			
3	X	A	RL	YL	GL	*	
		B	RL	YL	GL	*	
		E	DW	W			
		F	DW	W			
4	X	A	R	Y	GV	GR	
		B	R	Y	GV	GR	(MAST)
		C	R	Y	G		(ARM)
		E	DW	W			
		F	DW	W			
5	X	A	R	Y	G		
		E	DW	W			
		F	DW	W			
6	X	A	RL	YL	GL	*	
		B	RL	YL	GL	*	
		E	DW	W			
		F	DW	W			
7	X	A	R	Y	GV	GR	
		B	R	Y	GV	GR	(MAST)
		C	R	Y	G		(ARM)
		E	DW	W			
		F	DW	W			
8	X	E	DW	W			
		F	DW	W			
	*	12" vehicle lenses					
8	7	25	65	Total for Intersection			

Automatic Operation from 6:00 am to 2:00 am = 20 hours per day.
Pedestrian Signal Operation from ________ to ________ hours per day.
Remote P.B. Actuation from ________ to ________ = hours per day.
Flasher Operation from 2:00 am to 6:00 am = 4 hours per day.

Timer-Type Crouse-Hinds Flasher-Type Crouse-Hi

Coordinated ☒ Interconnected ☒ Non-Interconne ☐

Master at CLINTON ST. & J.F.F. EXPRESSWAY SURFACE RD.

OFFSETS	%
D1	
D2	
D3	

MASSACHUSETTS PERMIT	
Number	Date
B-1287	5/15/7

REMARKS

AIR QUALITY DATA

Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB INTERNATIONAL PLACE JOB No. 0788
LOCATION ______ SHEET ___ OF ___
CALCULATED BY BG DATE 4/9/84
CHECKED BY ______ DATE ______
TITLE AIR QUALITY DATA REQUIREMENTS

Location	Date of Count	Peak Hour Speed	Off-Peak Speed	8 hr/1 hr factor
OLIVER ST. EB	9/22-23/76 Peak 8-hour = 7:00AM-3:00PM	28	30	0.59
PURCHASE ST. S.B.	9/22-23/76 Peak 8-hour = 9:30AM-5:30PM	28	35	0.75

VH
Vanasse / Hangen Engineering, Inc.
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: INTERNATIONAL PLACE JOB No. 0788
LOCATION:
SHEET 1 OF 2
CALCULATED BY: BG DATE: 4/9/84
CHECKED BY: DATE:
TITLE: AIR QUALITY DATA REQUIREMENTS

Location	Date of Count	Peak Hour Speed	Off-Peak Speed	8 hr/1hr factor
* ATLANTIC AVE. (AT SURFACE ARTERY AND HIGH STREET)				
N.B. TO W.B.	1981	26	32	0.79
S.B. TO W.B.	1981	22	26	0.79
SURFACE ARTERY				
N.B. (FROM X-WAY)	1981	28	35	0.70
S.B.	1981	24	29	0.70
HIGH ST. / OLIVER ST.				
HIGH ST. S.B.	11/14/80 Peak 8-hour 7:00AM-3:00PM	25	30	0.67
CONGRESS ST. E.B.	8/1-2/79 Peak 8-hour = 10:00 PM-6:00PM	23	30	0.64
HIGH ST. S.B.	8/1-2/79 Peak 8-hour = 7:30AM-3:00PM	25	30	0.65
CONGRESS ST. E.B.	6/10/83 Peak 8-hour = 10:00AM-6:00PM	20	25	0.68
PURCHASE ST. S.B	6/10/83 Peak 8-hour = 10:00AM-6:00PM	20	30	0.70

* Values used on Rowes Wharf EIR.

VH
Vanasse / Hangen
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923
LOCATION: SHEET OF
CALCULATED BY: BG DATE:
CHECKED BY: DATE:
TITLE: AIR QUALITY CALCULATION

Intersection: Congress St. / Purchase

Congress St.
EB

Peak hour = 1232
Peak 8 hours = 6720
factor = 0.68

Purchase St
SB.

Peak hour = 1293
Peak 8 hours = 7272
factor = 0.70

Intersection: Oliver St. / Purchase St.

Oliver St.
EB

Peak hour = 460
Peak 8 hours = 2173
factor = 0.59

Purchase St.
SB

Peak hour = 1179
Peak 8 hours = 7080
factor = 0.75

VH
Vanasse / Hangen
Consulting Engineers & Planners
184 High Street, Boston, Massachusetts 02110
617 / 482-1870

JOB: International Place JOB No. 0923
LOCATION: SHEET OF
CALCULATED BY: BG DATE:
CHECKED BY: DATE:
TITLE: AIR QUALITY CALCULATION

Intersection: Congress St. / High St.

Congress St.
EB

Peak hour = 1093
Peak 8 hours = 5,600
factor = 0.64

High st.
SB

Peak hour = 690
Peak 8 hours = 3,588
factor = 0.65

Intersection: High St. / Oliver St.

High St.
SB

Peak hour = 618
Peak 8 hours = 3,309
factor = 0.67

Oliver st

RAPID TRANSIT RIDERSHIP

OPS-234

Red Line

PLANS AND SCHEDULES DEPARTMENT

SUMMARY OF TRAFFIC COUNTS

LOCATION: Andrew Station

YEAR: 84

ROUTE: Harvard Station - Ashmont Station

OUTBOUND	DATE: Mon. July 2					DATE:					DATE:					DATE:				
A.M.	WEATHER: Fair					WEATHER:					WEATHER:					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00																				
6:01 - 6:30																				
6:31 - 7:00																				
Subtotal																				
7:01 - 7:30																				
7:31 - 8:00																				
8:01 - 8:30																				
8:31 - 9:00																				
Subtotal																				
9:01 - 9:30																				
9:31 - 10:00																				
10:01 - 10:30																				
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 12:30																				
12:31 - 1:00																				
1:01 - 1:30																				
1:31 - 2:00	4	170	43																	
2:01 - 2:30	12	540	45																	
2:31 - 3:00	12	620	52																	
3:01 - 3:30	4	360	90																	
3:31 - 4:00	12	855	71																	
Subtotal	44	2545	58																	
4:01 - 4:30	16	1620	101																	
4:31 - 4:45	4	225	56																	
4:46 - 5:00	8	1240	155																	
5:01 - 5:15	4	800	200																	
5:16 - 5:30	8	1425	184																	
5:31 - 5:45	8	1150	144																	
5:46 - 6:00	8	506	63																	
Subtotal	56	7016	125																	
6:01 - 6:30	8	620	78																	
6:31 - 7:00	20	1000	50																	
7:01 - 7:30	8	570	71																	
7:31 - 8:00	12	525	44																	
8:01 - 8:30	8	300	38																	
8:31 - 9:00	4	380	95																	
9:01 - 9:30	6	400	67																	
9:31 - 10:00	4	110	28																	
10:01 - 10:30																				
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 1:00																				
Subtotal	70	3925	56																	
Total	170	13466	79																	

SUMMARY OF TRAFFIC COUNTS

LOCATION: Andrew Station YEAR: 82

ROUTE: Harvard Brattle Station - Braintree Station

OUTBOUND	Monday DATE: Feb. 1					Tuesday DATE: Feb. 2					Tues. DATE: July 13					Tues. DATE: Nov. 30				
A.M.	WEATHER: Cloudy-Rain					WEATHER: Cloudy					WEATHER: Cloudy					WEATHER: Fair				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00	8	79	10								4	48	12							
6:01 - 6:30	8	59	7								4	57	14							
6:31 - 7:00	4	48	12								16	208	13							
Subtotal	20	186	9								24	313	13							
7:01 - 7:30	8	175	22								12	370	31							
7:31 - 8:00	8	163	20								12	192	16							
8:01 - 8:30	20	440	22								20	380	19							
8:31 - 9:00	20	278	14								20	167	8			20	367	18		
Subtotal	56	1056	19								64	1109	19			20	367	18		
9:01 - 9:30	12	192	16								24	216	9			24	247	10		
9:31 - 10:00	24	312	13								24	208	9			20	326	66		
10:01 - 10:30	16	270	17								12	180	15			16	208	13		
10:31 - 11:00	12	152	13								8	175	22			16	195	12		
11:01 - 11:30	8	97	12								12	396	33			12	177	15		
11:31 - 12:00	12	172	14								12	251	21			12	221	18		
12:01 - 12:30	8	238	30								12	304	25			12	271	23		
12:31 - 1:00	12	252	21								12	427	36			12	337	28		
1:01 - 1:30	12	330	28								12	381	32			12	422	35		
1:31 - 2:00	8	380	48								8	317	40							
2:01 - 2:30	12	445	37								12	498	42							
2:31 - 3:00	8	426	53								8	356	45							
3:01 - 3:30						12	800	67			8	963	120							
3:31 - 4:00						16	2840	178			12	915	76							
Subtotal	144	3270	23			28	3640	130			176	5587	32			136	2404	18		
4:01 - 4:30						12	2540	212			16	1628	102							
4:31 - 4:45						12	2550	213			4	305	76							
4:46 - 5:00						8	2400	300			12	2500	208							
5:01 - 5:15						12	3135	261			8	1525	191							
5:16 - 5:30						4	1200	300			12	2860	238							
5:31 - 5:45						12	2335	194			6	605	101							
5:46 - 6:00						8	2175	272			4	295	74							
Subtotal						68	16325	240			62	9718	157							
6:01 - 6:30						12	1860	155			12	2930	244							
6:31 - 7:00						24	874	36			22	686	31							
7:01 - 7:30						12	280	23			16	495	31							
7:31 - 8:00						8	225	28			10	876	88							
8:01 - 8:30						12	385	32			6	235	39							
8:31 - 9:00						8	200	25			4	190	48							
9:01 - 9:30						8	130	16			6	300	50							
9:31 - 10:00						8	270	34			4	120	30							
10:01 - 10:30						8	200	25			6	255	43							
10:31 - 11:00						8	260	33			4	180	45							
11:01 - 11:30						8	170	21			4	80	20							
11:31 - 12:00						8	130	16			4	65	16							
12:01 - 1:00						16	266	17			6	31	5							
Subtotal						[illegible]	5250	33			104	6443	62							
Total	220	4512	21			[illegible]	25215	107			430	23170	54			156	2771	18		

OPS-234

Red Line

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: Charles Street Station YEAR: 84

ROUTE: Ashmont & Braintree Stations - Harvard Station

OUTBOUND	DATE: Mon. Feb. 13					DATE: Thurs. May 17					DATE: Mon. July 2					DATE:				
A.M.	WEATHER: Fair					WEATHER: Cloudy					WEATHER: Cloudy					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00																				
6:01 - 6:30																				
6:31 - 7:00																				
Subtotal			No Outbound																	
7:01 - 7:30																				
7:31 - 8:00																				
8:01 - 8:30																				
8:31 - 9:00				Counts																
Subtotal																				
9:01 - 9:30																				
9:31 - 10:00				Taken																
10:01 - 10:30																				
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 12:30																				
12:31 - 1:00																				
1:01 - 1:30																				
1:31 - 2:00											16	1780	111							
2:01 - 2:30											16	1290	81							
2:31 - 3:00											28	1730	108							
3:01 - 3:30											20	1454	73							
3:31 - 4:00											24	1792	75							
Subtotal											104	8046	77							
4:01 - 4:30											24	1230	51							
4:31 - 4:45											16	950	59							
4:46 - 5:00											8	280	35							
5:01 - 5:15											16	2050	130							
5:15 - 5:30											12	1700	142							
5:31 - 5:45											20	2150	108							
5:46 - 6:00											8	580	73							
Subtotal											104	8940	86							
6:01 - 6:30											20	1270	64							
6:31 - 7:00											20	865	43							
7:01 - 7:30											26	1053	41							
7:31 - 8:00											16	679	42							
8:01 - 8:30											6	389	65							
8:31 - 9:00											10	515	52							
9:01 - 9:30											10	445	45							
9:31 - 10:00											8	403	50							
10:01 - 10:30																				
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 1:00																				
Subtotal											116	5619	49							
Total											324	22605	70							

OPS-234

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: Arlington St. Station

YEAR: 84

ROUTE: 830 North Station - Cleveland Circle

OUTBOUND	DATE: Fri. Jan. 20					DATE: Fri. Feb. 17					DATE: Tues. May 29					DATE:				
A.M.	WEATHER: Fair					WEATHER: Cldy/Rain					WEATHER: Rain					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00	1	142	142			3	128	43			3	86	28							
6:01 - 6:30	2	61	31			3	184	61			3	220	73							
6:31 - 7:00	4	482	121			3	285	95			2	222	111							
Subtotal	7	685	98			9	597	66			8	518	65							
7:01 - 7:30	2	212	106			3	434	145			4	595	149							
7:31 - 8:00	5	842	167			5	769	154			5	810	162							
8:01 - 8:30	4	685	171			7	1039	148			8	1230	154							
8:31 - 9:00	1	180	180			6	1035	173			5	563	112							
Subtotal	12	1919	160			21	3277	156			22	3198	145							
9:01 - 9:30	2	185	93			10	811	81			8	908	114							
9:31 - 10:00	4	518	105			5	361	72			7	554	79							
10:01 - 10:30	7	693	99			7	351	50			7	228	32							
10:31 - 11:00	4	239	58			4	217	54			2	114	57							
11:01 - 11:30	7	388	55			6	350	58			9	402	44							
11:31 - 12:00	6	360	60			6	294	49			7	315	45							
12:01 - 12:30	4	399	100			6	244	41			5	390	78							
12:31 - 1:00	8	498	62			6	377	63			6	529	88							
1:01 - 1:30	5	347	70			5	318	64			7	585	84							
1:31 - 2:00	6	453	76			5	451	90			7	445	64							
2:01 - 2:30	3	251	84			6	612	102			6	457	76							
2:31 - 3:00	5	285	57			6	336	56			5	435	87							
3:01 - 3:30	7	364	52			6	644	107			5	694	139							
3:31 - 4:00	5	728	146			4	597	149			8	846	106							
Subtotal	73	5708	78			82	5763	73			89	6902	78							
4:01 - 4:30	7	892	127			8	623	77			6	650	108							
4:31 - 4:45	5	653	131			4	705	176			4	538	135							
4:46 - 5:00	2	360	180			3	438	146			3	508	169							
5:01 - 5:15	2	360	180			5	713	143			4	675	169							
5:16 - 5:30	1	180	180			4	720	180												
5:31 - 5:45	3	540	180			2	360	180			5	820	164							
5:46 - 6:00	5	875	175			3	540	180			4	637	159							
Subtotal	25	3860	155			29	4289	141			26	3828	147							
6:01 - 6:30	8	999	125			8	953	119			8	875	109							
6:31 - 7:00	3	406	135			7	560	80			3	495	165							
7:01 - 7:30	5	327	65			4	362	91			4	450	113							
7:31 - 8:00	4	344	86			4	218	55			3	325	108							
8:01 - 8:30	2	125	63			3	225	75			5	280	56							
8:31 - 9:00	5	273	55			4	200	50			4	258	65							
9:01 - 9:30	4	244	61			5	198	40			4	215	54							
9:31 - 10:00	2	66	33			2	128	64			4	205	51							
10:01 - 10:30	4	204	51			3	224	75			2	125	63							
10:31 - 11:00	5	261	52			5	142	28			3	138	43							
11:01 - 11:30	2	98	49			3	172	57			1	40	40							
11:31 - 12:00	3	126	42			3	222	74												
12:01 - 1:00	3	128	43			3	239	80												
1:00 - 1:30	1	58	58			1	40	40												
Subtotal	51	3559	70			55	3053	71			41	3406	83							
Total	163	15531	94			175	17307	91			186	17852	96							

OPS-234

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: Arlington Street Station YEAR: 84

ROUTE: 811 Government Center - Boston College

OUTBOUND	DATE: Fri. Jan. 20					DATE: Fri Feb. 17					DATE: Tues. May 29					DATE:				
A.M.	WEATHER: Fair					WEATHER: Cldy./Rain					WEATHER: Rain					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00	1	133	133			1	135	135			2	154	77							
6:01 - 6:30	4	279	70			4	243	61			3	98	33							
6:31 - 7:00						3	395	132			4	485	121							
Subtotal	5	412	82			8	773	97			9	734	82							
7:01 - 7:30	7	698	100			5	607	121			4	408	102							
7:31 - 8:00	3	540	180			5	780	156			4	680	170							
8:01 - 8:30	6	1080	180			6	1040	173			8	912	114							
8:31 - 9:00	1	180	180			9	1220	136			7	1004	143							
Subtotal	17	2498	147			25	3647	146			23	3004	131							
9:01 - 9:30	2	347	174			9	347	38			8	378	47							
9:31 - 10:00	8	1085	109			6	235	39			5	389	78							
10:01 - 10:30	11	1466	133			9	378	42			6	210	35							
10:31 - 11:00	4	259	65			6	211	35			2	130	65							
11:01 - 11:30	5	226	45			5	413	83			8	575	72							
11:31 - 12:00	7	430	61			6	341	57			6	284	48							
12:01 - 12:30	4	283	71			6	512	85			5	424	85							
12:31 - 1:00	6	474	79			4	338	85			6	527	88							
1:01 - 1:30	5	310	62			4	123	30			6	355	59							
1:31 - 2:00	6	393	66			5	315	63			7	698	100							
2:01 - 2:30	6	973	162			5	251	50			3	247	82							
2:31 - 3:00	6	309	52			4	444	111			8	525	66							
3:01 - 3:30	6	284	47			5	433	87			5	316	63							
3:31 - 4:00	4	437	109			3	417	139			7	453	65							
Subtotal	80	7276	91			80	5198	65			83	5511	66							
4:01 - 4:30	7	793	113			6	471	79			7	764	109							
4:31 - 4:45	2	360	180			2	345	173			4	258	64							
4:46 - 5:00	2	360	180			4	655	164			2	328	164							
5:01 - 5:15	2	360	180			5	425	85			3	455	152							
5:15 - 5:30	1	180	180								5	860	172							
5:31 - 5:45	2	360	180			5	730	146			3	387	129							
5:46 - 6:00	4	608	152			4	616	154			6	716	119							
Subtotal	20	3021	151			26	3242	125			30	3768	126							
6:01 - 6:30	5	730	146			4	616	154			7	907	129							
6:31 - 7:00	5	579	116			7	744	106			5	686	137							
7:01 - 7:30	4	349	87			4	445	111			4	485	121							
7:31 - 8:00	4	478	120			4	447	112			4	162	41							
8:01 - 8:30	2	220	110			3	161	54			2	180	90							
8:31 - 9:00	3	316	105			5	365	73			3	178	59							
9:01 - 9:30	5	474	95			4	374	94			4	215	54							
9:31 - 10:00	3	263	88			2	178	89			4	175	44							
10:01 - 10:30	3	250	83			5	429	86			3	210	70							
10:31 - 11:00	3	224	75			4	333	83			4	217	54							
11:01 - 11:30	4	390	97			3	215	72			1	30	30							
11:31 - 12:00	2	260	130			3	239	80												
12:01 - 1:00	3	257	86			4	346	87												
1:00 - 1:30	1	64	64			1	38	38												
Subtotal	47	4856	103			53	4492	94			41	3445	84							
Total	169	18061	107			192	17352	93			186	16465	89							

LOCATION: Arlington St. Sta. D YEAR: 83

ROUTE: # 850 Lechmere Sta. —— Riverside Sta.

OUTBOUND	DATE: Tues. Jan. 11					DATE: Tues. April 26					DATE:					DATE:				
A.M.	WEATHER: Cloudy					WEATHER: Cloudy					WEATHER:					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O
5:00 - 6:00	2	47	29			1	68	68												
6:01 - 6:30	1	142	142			2	152	76												
6:31 - 7:00	2	200	100			1	131	131												
Subtotal	5	389	78			4	351	88												
7:01 - 7:30	2	234	117			4	417	104												
7:31 - 8:00	2	350	175			2	360	180												
8:01 - 8:30	4	580	145	1117		8	1168	144												
8:31 - 9:00	9	537	60			9	1324	147												
Subtotal	17	1701	100			23	3269	142												
9:01 - 9:30	9	399	44			7	591	84												
9:31 - 10:00	5	176	35			5	357	71												
10:01 - 10:30	8	186	23			8	466	58												
10:31 - 11:00	6	179	36			7	357	71												
11:01 - 11:30	5	179	36			4	204	51												
11:31 - 12:00	5	189	38			6	320	53												
12:01 - 12:30	4	159	40			7	509	73												
12:31 - 1:00	6	312	52			5	401	80												
1:01 - 1:30	6	349	58			5	328	66												
1:31 - 2:00	5	460	92			5	445	89												
2:01 - 2:30	7	250	36			5	381	76												
2:31 - 3:00	1	180	180			5	423	85												
3:01 - 3:30	6	461	76			6	458	76												
3:31 - 4:00	8	605	76			9	865	96												
Subtotal	81	4084	50			84	6105	73												
4:01 - 4:30	7	624	89			6	671	112												
4:31 - 4:45	8	944	118			3	193	64												
4:45 - 5:00	3	310	103			5	536	107												
5:01 - 5:15	5	550	110	[illegible]		4	601	150												
5:16 - 5:30	4	700	175			3	502	151												
5:31 - 5:45	4	531	135			5	591	118												
5:46 - 6:00	6	501	83			4	355	89												
Subtotal	37	4160	113			30	3449	115												
6:01 - 6:30	8	659	82			6	573	97												
6:31 - 7:00	8	424	53			5	294	59												
7:01 - 7:30	8	498	62			5	508	102												
7:31 - 8:00	7	461	66			7	391	56												
8:01 - 8:30	3	385	128			7	353	50												
8:31 - 9:00	3	194	65			3	146	49												
9:01 - 9:30	4	285	71			3	313	104												
9:31 - 10:00	5	356	51			3	167	56												
10:01 - 10:30	3	158	53			2	94	37												
10:31 - 11:00	3	145	48			4	206	52												
11:01 - 11:30	3	149	50			3	162	54												
11:31 - 12:00	3	108	36			3	126	42												
12:01 - 1:00	6	213	36			6	151	25												
						2	37	19												
Subtotal	64	3935	61			57	3521	60												
Total	204/14	269	70			200	16695	83												

OPS-234

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: Lechmere Station YEAR: 83

ROUTE: 850 Riverside Sta. — Lechmere Sta.

INBOUND	DATE: Fri. Sept 30					DATE: Mon. Oct. 3					DATE					DATE:				
A.M.	WEATHER: Pt. Cldy.					WEATHER: Fair					WEATHER:					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00	7	32	5																	
6:01 - 6:30	6	75	13																	
6:31 - 6:45	5	57	11																	
6:46 - 7:00	3	42	14																	
Subtotal	21	206	10																	
7:01 - 7:15	2	22	11																	
7:16 - 7:30	3	97	32																	
7:31 - 7:45	4	73	18																	
7:46 - 8:00	2	32	16																	
8:01 - 8:15	1	16	16																	
8:16 - 8:30	6	85	14																	
8:31 - 8:45	4	39	10																	
8:46 - 9:00	2	51	26																	
Subtotal	24	415	17																	
9:01 - 9:30	5	48	10																	
9:31 - 10:00	10	60	6																	
10:01 - 10:30	6	35	6																	
10:31 - 11:00	4	29	7																	
11:01 - 11:30	6	32	5																	
11:31 - 12:00	7	53	8																	
12:01 - 12:30	6	90	15																	
12:31 - 1:00	4	69	17																	
1:01 - 1:30	3	222	74																	
1:31 - 2:00	2	104	52			6	197	33												
2:01 - 2:30						5	183	37												
2:31 - 3:00						7	227	32												
3:01 - 3:30						5	201	40												
3:31 - 4:00						5	379	76												
Subtotal	53	742	14			28	1187	42												
4:01 - 4:30						6	360	60												
4:31 - 5:00						5	440	88												
5:01 - 5:30						8	624	78												
5:31 - 6:00						4	325	81												
Subtotal						23	1749	76												
6:01 - 6:30						9	412	46												
6:31 - 7:00						4	151	38												
7:01 - 7:30						7	120	17												
7:31 - 8:00						5	96	19												
8:01 - 8:30						5	64	13												
8:31 - 9:00						5	80	16												
9:01 - 9:30						2	80	40												
9:31 - 10:00						5	81	16												
10:01 - 10:30																				
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 1:00																				
Subtotal						42	1084	26												
Total	98	1363	14			93	4020	43												

OPS-234

Orange Line

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: North Station R.T.L. YEAR: 84

ROUTE: Forest Hills Station - Oak Grove Station

OUTBOUND	DATE: Tues. Jan. 10					DATE: Thurs. Feb. 2					DATE: Fri. May 18					DATE: Tues. June 19				
A.M.	WEATHER: Cloudy					WEATHER: Fair					WEATHER: Cloudy					WEATHER: Cloudy				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00											6	195	33							
6:01 - 6:30	10	256	26								10	302	30							
6:31 - 7:00	16	705	44								12	462	39							
Subtotal	26	961	37								28	959	34							
7:01 - 7:30	20	613	31								20	619	31							
7:31 - 8:00	28	1123	40								32	780	24							
8:01 - 8:30	32	705	22								24	286	12							
8:31 - 9:00	32	675	21								24	528	22							
Subtotal	112	3116	28								100	2213	22							
9:01 - 9:30	32	215	7								32	409	13							
9:31 - 10:00	16	119	7								32	204	6							
10:01 - 10:30	20	189	9								20	599	30							
10:31 - 11:00	16	196	12								24	326	14							
11:01 - 11:30	16	233	15								8	466	58							
11:31 - 12:00	16	190	12								32	816	25							
12:01 - 12:30	16	246	15								12	669	56							
12:31 - 1:00	16	345	22								16	459	29							
1:01 - 1:30	16	445	28								16	572	35							
1:31 - 2:00	12	280	23								20	503	25							
2:01 - 2:30	20	478	24								16	477	30			12	465	39		
2:31 - 3:00	16	446	28								16	845	53			16	715	45		
3:01 - 3:30	16	672	42			8	437	55			16	1455	91			16	1095	68		
3:31 - 4:00	16	1371	86			20	1841	92			16	2070	129			20	2200	110		
Subtotal	244	5425	23			28	2278	81			276	9810	36			64	4475	70		
4:01 - 4:30	20	1822	91			32	2512	79			36	3408	95			36	2805	78		
4:31 - 4:45	16	1943	121			16	1716	107			20	2020	101			20	2740	137		
4:46 - 5:00	12	2410	201			12	2095	175			12	1840	153			12	2110	176		
5:01 - 5:15	16	3906	244			20	3580	179			20	3390	170			16	2880	180		
5:16 - 5:30	16	2572	161			16	2038	127			16	1300	81			16	2545	159		
5:31 - 5:45	16	1678	105			20	1753	88			20	1306	65			16	1880	118		
5:46 - 6:00	16	698	44			20	1298	65			20	1084	54			20	1880	94		
Subtotal	112	15029	134			136	14992	110			144	14348	100			136	16840	124		
6:01 - 6:30	20	585	29								20	1024	51			24	1025	43		
6:31 - 7:00	16	491	31								24	742	31							
7:01 - 7:30	16	448	29								12	308	26							
7:31 - 8:00	8	313	39								6	591	99							
8:01 - 8:30	16	186	12								4	232	58							
8:31 - 9:00	12	298	25								6	296	49							
9:01 - 9:30	8	123	15								4	173	43							
9:31 - 10:00	12	108	9								4	145	36							
10:01 - 10:30	8	48	6																	
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 1:00																				
Subtotal	116	2600	22								80	3511	44			24	1025	43		
Total	610	27131	44			164	17270	105			628	30891	49			[illegible]	22320	95		

OPS-234

Orange Line

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: Essex Street Station YEAR: 84

ROUTE: Oak Grove Station - Forest Hills Station

OUTBOUND	DATE: Thurs. Jan 12					DATE: Tues 6-19-84					DATE: Fri July 13					DATE:				
A.M.	WEATHER: Cloudy					WEATHER: RAIN					WEATHER: Pt. Cldy					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00											8	54	7							
6:01 - 6:30	12	79	7								12	177	15							
6:31 - 7:00	24	397	17								24	357	15							
Subtotal	36	476	13								44	588	13							
7:01 - 7:30	28	478	14								28	345	12							
7:31 - 8:00	32	735	23								32	689	22							
8:01 - 8:30	32	599	16								32	753	24							
8:31 - 9:00	24	505	21								32	694	22							
Subtotal	116	2317	20								124	2481	20							
9:01 - 9:30	24	309	13								20	352	18							
9:31 - 10:00	8	442	55								16	315	20							
10:01 - 10:30	20	488	24								16	295	18							
10:31 - 11:00	24	434	18								12	305	25							
11:01 - 11:30	20	546	27								12	330	28							
11:31 - 12:00	12	512	43								16	355	22							
12:01 - 12:30	4	134	34								16	320	20							
12:31 - 1:00											16	405	25							
1:01 - 1:30	12	578	48								16	421	26							
1:31 - 2:00	4	880	220								16	585	37							
2:01 - 2:30	8	1215	152			12	698	59			16	815	51							
2:31 - 3:00	16	782	49			16	1200	75			12	620	52							
3:01 - 3:30	16	1209	76			16	1125	71			16	1145	72							
3:31 - 4:00	24	1191	49			24	1515	64			28	2160	77							
Subtotal	192	8720	-45			68	4532	67			228-	8423-	37							
4:01 - 4:30	12	1372	114			36	2190	61			28	2970	106							
4:31 - 4:45						16	1055	66			12	855	71							
4:46 - 5:00						20	1475	74			16	1420	89							
5:01 - 5:15						20	1615	81			12	1490	124							
5:15 - 5:30	8	1760	220			12	1230	103			24	2918	124							
5:31 - 5:45	12	2640	220			16	1380	87			12	1170	99							
5:46 - 6:00	16	1993	125			16	850	54			16	1175	73							
Subtotal	48	7765	162			136	9795	73			120-	11998-	100							
6:01 - 6:30	20	1049	52			24	1445	61			24	1230	51							
6:31 - 7:00	16	533	33								8	380	48							
7:01 - 7:30	12	497	41								8	765	96							
7:31 - 8:00	12	430	36								16	450	28							
8:01 - 8:30	12	322	27								6	302	50							
8:31 - 9:00	8	235	29								6	263	44							
9:01 - 9:30	8	182	23								6	275	46							
9:31 - 10:00	12	246	21								2	72	36							
10:01 - 10:30	8	117	15																	
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 1:00																				
Subtotal	108	3601	33			24	1445	61			76-	3737-	49							
Total	500-	22879-	46			228-	15778-	70			592-	27227-	46							

Blue Line

OPS-234

PLANS AND SCHEDULES DEPARTMENT
SUMMARY OF TRAFFIC COUNTS

LOCATION: Aquarium Station R.T.L. YEAR: 84

ROUTE: Bowdoin Station - Wonderland Station

OUTBOUND	DATE: Wed. Jan. 11					DATE: Thurs. Jan. 12					DATE: Thurs. May 17					DATE:				
A.M.	WEATHER: Fair					WEATHER: Fair					WEATHER: Cloudy					WEATHER:				
TIME:	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U	V	Tot. Pass.	Aver.	Std. Cap.	O/U
5:00 - 6:00																				
6:01 - 6:30						12	64	5												
6:31 - 7:00						28	241	9												
Subtotal						40	305	8												
7:01 - 7:30						24	416	17												
7:31 - 8:00						40	422	11												
8:01 - 8:30						20	597	30												
8:31 - 9:00						32	383	12												
Subtotal						116	1818	16												
9:01 - 9:30						28	290	10												
9:31 - 10:00						12	164	14												
10:01 - 10:30						16	174	11												
10:31 - 11:00						16	247	15												
11:01 - 11:30						16	322	20												
11:31 - 12:00						16	348	22												
12:01 - 12:30						16	306	19												
12:31 - 1:00						12	283	24												
1:01 - 1:30						16	385	24												
1:31 - 2:00						16	372	24			16	806	50							
2:01 - 2:30	12	331	28								16	744	47							
2:31 - 3:00	12	423	35								16	1820	114							
3:01 - 3:30	16	750	47								16	1420	89							
3:31 - 4:00	16	628	39								20	1474	74							
Subtotal	56	2132	38			164	2892	18			84	6264	75							
4:01 - 4:30	32	1659	52								32	2046	64							
4:31 - 4:45	16	1231	77								24	2429	101							
4:46 - 5:00	16	1083	68								16	1644	103							
5:01 - 5:15	12	1740	145								20	1928	96							
5:16 - 5:30	20	1538	77								16	1446	90							
5:31 - 5:45	20	1262	63								24	1380	58							
5:46 - 6:00	16	548	34								12	475	40							
Subtotal	132	9061	69								144	11348	78							
6:01 - 6:30	16	803	50								20	975	49							
6:31 - 7:00	16	460	29								10	680	68							
7:01 - 7:30	20	625	31								8	515	64							
7:31 - 8:00	12	337	28								8	385	48							
8:01 - 8:30	12	338	28								8	325	41							
8:31 - 9:00	8	235	29								6	230	38							
9:01 - 9:30	8	224	28								6	265	44							
9:31 - 10:00	8	277	35								2	60	30							
10:01 - 10:30	8	216	27																	
10:31 - 11:00																				
11:01 - 11:30																				
11:31 - 12:00																				
12:01 - 1:00																				
Subtotal	108	3515	33								68	3435	51							
Total	296	14708	50			320	5015	16			292	21047	71							

COMMUTER RAIL RIDERSHIP

[redacted]

P. M. PEAK

RUSH-HOUR PERFORMANCE

[redacted]: ______________

[redacted]

NORTH SERVICE

[redacted]

LINE	TRAIN	DESTIN.	LV. BOSTON	SCHLD. ARR.	NO CARS [redacted]	AVERAGE Ridership [redacted]	CAUSE/REMARKS
Eastern	231	IPS	1630	1725	4	300	
	533	RKPT	1700	1812	5	500	
	235	IPS	1710	1806	5	400	
	537	RKPT	1725	1838	3	350	
	239	IPS	1735	1830	3	330	
	541	RKPT	1800	1916	3	260	
Reading	819	RDG	1600	1627	4	150	
	121	HVRHL	1630	1736	3	250	
	823	RGD	1655	1722	4	275	
	125	HVRHL	1715	1820	4	500	
	827	RDG	1725	1752	5	265	
New Hamp.	323	LWL	1605	1644	2	150	
	925	WIN	1625	1640	3	75	
	327	LWL	1700	1739	4	420	
	929	WIN	1715	1730	2	150	
	331	LWL	1730	1810	3	255	
	933	WIN	1745	1800	2	90	
Gard./ Fitch.	609	S.ACT.	1600	1652	2	130	
	457	FITCH	1650	1818	4	350	
	611	S.ACT.	171	1801	3	165	
	413	GARD	1730	1916	3	400	

SOUTH SERVICE

[redacted]

LINE	TRAIN	DESTIN.	LV. BOSTON	SCHLD. ARR.	NO CARS	AVERAGE Ridership	CAUSE/REMARKS
Fram.	5361	FRAM.	1630	1710	4	330	
	5363	FRAM.	1655	1744	4	550	
	5369	FRAM.	1720	1810	6	575	
	5373	FRAM.	1745	1834	3	360	
Franklin	7159	FKLN.	1602	1652	5	400	
	7363	NOR.CTL.	1649	1719	5	450	
	7165	FKLN.	1707	1751	6	825	
	7169	FRKLN.	1725	1821	8	800	
Shore	8359	CANT.JCT.	1615	1639	8	320	
	8161	ATTL.	1641	1729	7	635	
	8167	ATTL.	1711	1755	7	725	
	8369	CANT.JCT.	1720	1742	6	440	
	8173	ATTL.	1741	1825	5	525	
Stoughton	8963	STGN.	1645	1716	4	370	
	8967	STGN.	1715	1748	6	475	
	8973	STGN.	1745	1820	5	325	

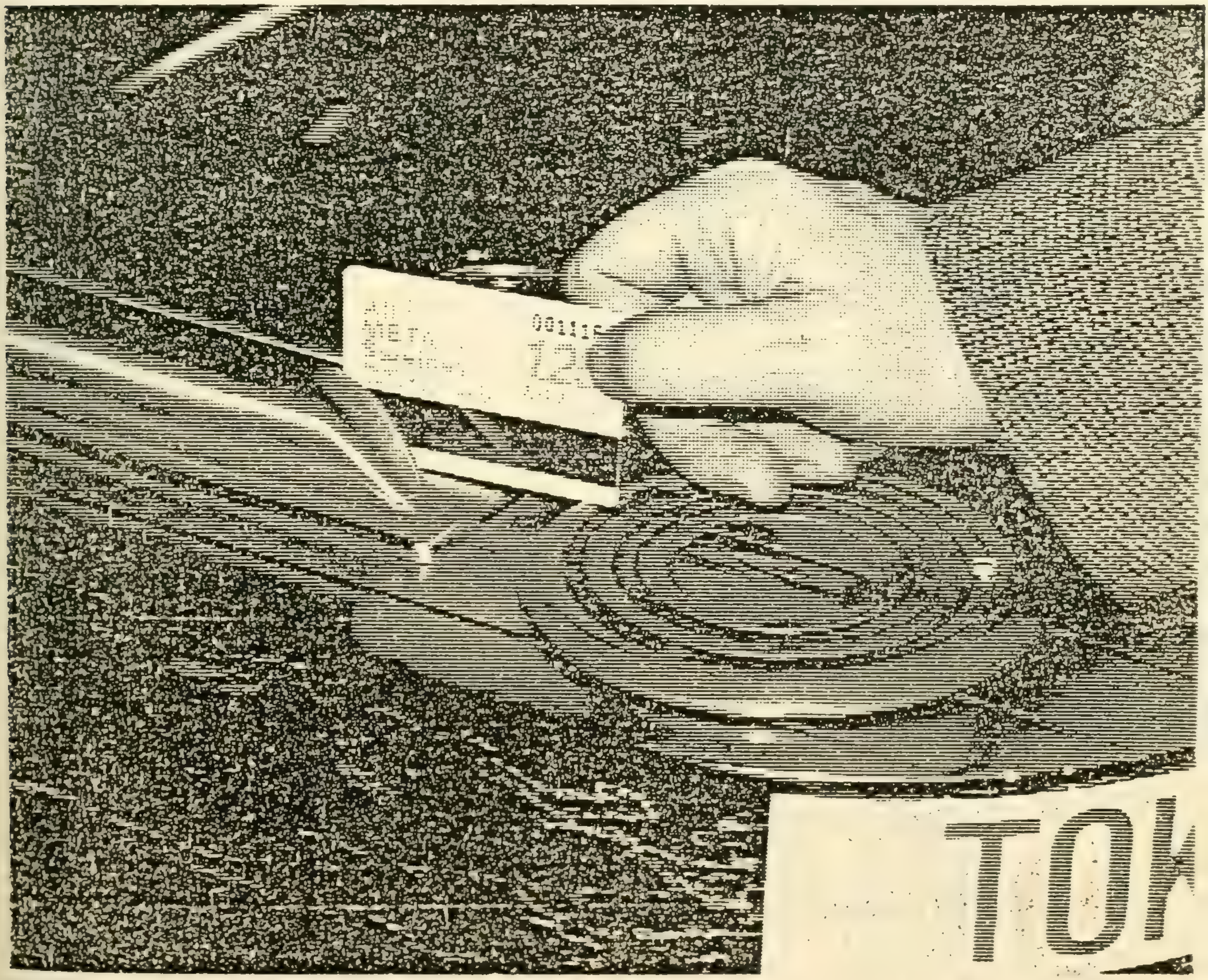
RAPID TRANSIT CAPACITY

Massachusetts Bay Transportation Authority December 1983

Final Environmental and Socioeconomic Impact Report

The M.B.T.A. Fare Increase

Appendices



Prepared by the Central Transportation Planning Staf

RED LINE "HYBRID" CAR

A) # SEATS/CAR 58

B) STANDEE SPACE 324 sq. ft.

C) STANDEE CAPACITY

Normal load @ 2.5 sq. ft.	129	Crush load @ 1.75 sq. ft.	186

D) TOTAL PASSENGERS/CAR

Normal load	187	Crush load	244

E) TRAIN CAPACITY

@ existing 4 cars		@ potential 6 cars	
Normal load	748	Normal load	1,122
Crush load	976	Crush load	1,464

ACTIVE FLEET 164 PEAK REQ'T 114 (26F + 2 Five)

ALLOWED TRIP TIME 78 minutes

CONSTRAINT (15% of Active Fleet) 140 (35F)

TRAIN FREQUENCY	ACTUAL	POTENTIAL	DESIGN	CONSTRAINT (with current fleet) 4 cars/train	6 cars/train
headway (minutes)	3.0	2.0	1.5	2.2	3.4
# trains/hour	20	30	40	27	18
effective capacity	.85	.78	.71	.80	.87

	NORMAL LOAD @ 4 Cars	@ 6 Cars	CRUSH LOAD @ 4 Cars	@ 6 Cars
ACTUAL	12,716	19,074	16,592	24,888
POTENTIAL	17,503	26,255	22,838	34,258
DESIGN	21,243	31,865	27,718	41,578
CONSTRAINT	16,157	19,571	21,082	22,926

ABSOLUTE THEORETICAL CAPACITY

NORMAL LOAD @ 4 Cars	@ 6 Cars	CRUSH LOAD @ 4 Cars	@ 6 Cars
29,920	44,880	39,040	58,560

CURRENT ESTIMATED PEAK HOUR VOLUME 15,000 (3/82)

ORANGE LINE

#2 MAIN

A) # SEATS/CAR 58

B) STANDEE SPACE 243 sq. ft.

C) STANDEE CAPACITY

Normal load @ 2.5 sq. ft. 97

Crush load @ 1.75 sq. ft. 139

D) TOTAL PASSENGERS/CAR

Normal load 155

Crush load 197

E) TRAIN CAPACITY

@ existing 4 cars

Normal load 620

Crush load 788

@ potential 6 cars

Normal load 930

Crush load 1,192

ACTIVE FLEET 120

PEAK REQ'T 68 (17F)

ALLOWED TRIP TIME 77 minutes

CONSTRAINT (15% of Active Fleet) 102(25F)

TRAIN FREQUENCY	ACTUAL	POTENTIAL	DESIGN	CONSTRAINT (with current fleet) 4 cars/train	6 cars/train
headway (minutes)	4.5	2.0	1.5	3.1	4.5
# trains/hour	13	30	40	19	13
effective capacity	.89	.78	.71	.85	.89

	NORMAL LOAD @ 4 Cars	NORMAL LOAD @ 6 Cars	CRUSH LOAD @ 4 Cars	CRUSH LOAD @ 6 Cars
ACTUAL	7,173	10,760	9,117	13,676
POTENTIAL	14,508	21,762	18,439	27,659
DESIGN	17,608	26,412	22,379	33,569
CONSTRAINT	10,013	12,726	10,760	13,676

ABSOLUTE THEORETICAL CAPACITY

NORMAL LOAD @ 4 Cars	NORMAL LOAD @ 6 Cars	CRUSH LOAD @ 4 Cars	CRUSH LOAD @ 6 Cars
24,800	37,200	31,520	47,280

CURRENT ESTIMATED PEAK HOUR VOLUME 7,000 (3/82)

BLUE LINE

#4 EAST BOSTON

A) # SEATS/CAR 42

B) STANDEE SPACE 170 sq. ft.

C) STANDEE CAPACITY

Normal load @ 2.5 sq. ft.	68	Crush load @ 1.75 sq. ft.	97

D) TOTAL PASSENGERS/CAR

Normal load	110	Crush load	139

E) TRAIN CAPACITY 4 CARS

Normal load	440	Crush load	556

ACTIVE FLEET 70 PEAK REQ'T 40 (10F)

ALLOWED TRIP TIME 45 minutes

CONSTRAINT (15% of Active Fleet) 60 (15F)

TRAIN FREQUENCY	ACTUAL	POTENTIAL	SIGNAL DESIGN	CONSTRAINT (with current fleet)
headway (minutes)	4.5	2.0	1.5	3.5
# trains/hour	13	30	40	20
effective capacity	.80	.78	.71	.85

	NORMAL LOAD	CRUSH LOAD
ACTUAL	5,091	6,432
POTENTIAL	10,296	13,010
DESIGN	12,496	15,790
CONSTRAINT	7,480	9,452

ABSOLUTE THEORETICAL CAPACITY
(@ 4 Cars)

NORMAL LOAD	CRUSH LOAD
17,600	22,239

CURRENT ESTIMATED PEAK HOUR VOLUME 6,000 (3/82)

GREEN LINE "HYBRID" CAR

A) # SEATS/CAR 42 PCC/52 LRV

B) STANDEE SPACE 148 sq. ft. PCC/284 sq. ft. LRV

C) STANDEE CAPACITY

Normal load @ 2.5 sq. ft.	59 PCC/113 LRV	Crush load @ 1.75 sq. ft.	84 PCC/162 LRV

D) TOTAL PASSENGERS CAR

Normal load	101 PCC/165 LRV	Crush load	126 PCC/214 LRV

E) TRAIN CAPACITY

@ existing (Hybrid of 1 LRV/2 PCC)		@ potential (Hybrid of 2 LRV/3 PCC)	
Normal load	174	Normal load	363
Crush load	223	Crush load	449

ACTIVE FLEET 196 PEAK REQ'T 120

ALLOWED TRIP TIME 88

CONSTRAINT (15% of Active Fleet) 167(34T + 99S)

TRAIN FREQUENCY	ACTUAL	POTENTIAL[1]	CONSTRAINT	POTENTIAL[2] HYBRID 3 car PCC / 2 car LRV
headway (seconds)	55	30	40	73
# trains/hour	65	120	90	49
effective capacity	.55	.25	.42	.65

	NORMAL LOAD		CRUSH LOAD	
	Existing	Potential	Existing	Potential
ACTUAL	6,221	12,977	7,972	16,052
POTENTIAL	5,220	10,890	6,690	13,470
CONSTRAINT	6,577	11,562	8,429	14,300

ABSOLUTE THEORETICAL CAPACITY

NORMAL LOAD		CRUSH LOAD	
Existing	Potential	Existing	Potential
20,880	43,560	26,760	53,880

CURRENT ESTIMATED PEAK HOUR VOLUME 7,000

[1] Potential for currently used cars calculated by creating a "hybrid vehicle" and weighting an average for a 2 car PCC and 1 car LRV.

[2] Potential hybrid car train for future use has a capacity based on weighted average of 3 PCCs and 2 LRVs.

EXCERPTS FROM PREVIOUS REPORTS

3.2 LAND USE

"THIRD HARBOR TUNNEL, INTERSTATE 90/CENTRAL ARTERY, INTERSTATE 93" SUPPLEMENT TO THE DRAFT ENVIRONMENTAL IMPACT STATEMENT/REPORT DATED JUNE, 1983

The MBTA also operates a major surface bus terminal at Haymarket Station. Several bus routes serving the North Shore and utilizing the Sumner and Callahan Tunnels were described in the DEIS/DEIR. Numerous other routes also serve Haymarket Station. Bus Routes 92, 93, and 111 use local streets through Charlestown and City Square to arrive at the Haymarket terminal or downtown Boston destinations. Bus Routes 325, 326, 353, 354, and 426 enter Boston via Interstate Route 93 on the Mystic-Tobin Bridge and use the Haymarket exit from the Central Artery to enter the Haymarket terminal or continue to other downtown destinations. Bus Route 350 enters Boston via the Longfellow Bridge.

Private carrier bus routes operated through the study area include longer-distance routes serving communities in northeast Massachusetts, New Hampshire, Maine, and Vermont. These services are provided by Greyhound, Trailways, and Trombly Motor Coach, among others.

The MBTA also operates an extensive commuter rail system to the north and west of Boston from North Station. Five routes are currently operated, with their respective termini being located in Rockport, Ipswich, Haverill, Lowell, and Gardner. All routes operate seven days per week with reduced service on Saturdays and Sundays. Amtrak trains depart from South Station throughout the day for points along the Northeast Corridor as far as Washington, DC, and to Chicago, Illinois.

3.2 LAND USE

This section briefly describes land use in the following districts: South Boston/Fort Point Channel; the Financial District; the Waterfront; Government Center; the North End; North Station; the West End; and Charlestown. These districts are shown on Figure 79. More detailed information on these areas is contained in the supplemental report on Land Use, Community Facilities and Economic Activities prepared as part of this Supplemental DEIS/DEIR. These areas comprise the areas of potential additional effect of Alternatives 3A, 5A, 5A Modified, and 6 as compared to the No-Build Alternative and Alternatives 3 and 5 in the DEIS/DEIR. Major land uses in each area are listed in Table 59, are presented on Figures 80 and 81, and are described in the following subsections.

The DEIS/DEIR (Section 3.2) contains descriptions of land use in the remaining districts of the project area, including the South End, the residential portion of South Boston, the Industrial Triangle, the Leather District, Chinatown/South Cove, East Boston, Logan Airport, and Route 1A North. For more detailed information on these areas, refer to Section 3.2 and the supplemental report, Land Use, Community Facilities, and Economic Activity Inventory, of the DEIS/DEIR.

3.2.1 Overview

The project area contains a diversity of land uses. The Financial District, Government Center and North Station areas house public and private offices, commercial and retail activities, transportation uses and entertainment facilities; these areas have very small residential populations.

Predominant activities in the South Boston/Fort Point Channel area are manufacturing, warehousing and food distribution activities. Vacant and underused parcels in this area will generate substantial mixed use development activity over the next decade.

The Waterfront has recently undergone a transformation from industry and warehousing, to high-priced residences and office space. Faneuil Hall Market Place and the New England Aquarium are significant tourist attractions.

The North End is a cohesive residential neighborhood, with a

Source: "Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93" supplement to the Draft Environmental Impact Statement/Report dated June, 1983.

MAJOR LAND USES (FUTURE) USED IN
THIRD HARBOR TUNNEL/CENTRAL ARTERY
ENVIRONMENTAL IMPACT STATEMENT

Table 19
MAJOR LAND USES IN THE PROJECT AREA

SOUTH BOSTON (See Figure 81)

Existing Uses

1. Dockside Place (condominiums)
2. Temporary housing for Navy personnel
3. Small commercial buildings
4. 303 Congress Street (offices)
5. Stone & Webster Engineering Corporation (offices)
6. Neptune Lobster Company
7. Anthony's Pier 4 Restaurant, Piers 1-3
8. Fish Pier
9. Pier Grill
10. Fargo Building (U.S. Government offices)
11. McKie Lighter Company (industrial)
12. The Gillette Company (manufacturing)
13. Mixed-use industrial area
14. Lindenmeyr Paper Company
15. Boston Plate and Window Glass
16. New England Seafood Center
17. Paul's Lobster Company, Stavis Seafood
18. Boyser, Inc. (manufacturing)
19. Bardley Company (manufacturing)
20. Pier Transmission
21. Boston Harbor Industrial Park
22. Boston Marine Industrial Park
23. Conley Marine Terminal
24. Boston Tea Party Ship Museum
25. Children's Museum
26. Our Lady of Good Voyage Chapel
27. U.S. Post Office parking
28. CONRAIL Track
29. South Boston Army Base

Future Uses

30. Northern Avenue Bridge
31. Former Penn Central Parcel (offices)
32. Boston Wharf properties (offices, residential)
33. 249-259 A Street (artists' studios)
34. Commonwealth Pier, BOSCOM (commercial)
35. Commonwealth Flats (light industrial, offices)
36. Massport Marine Terminal

FINANCIAL DISTRICT (See Figure 80)

Existing Uses

1. Devonshire Towers (residential)
2. Blue Cross/Blue Shield Building (offices)
3. 155 Federal Street (offices)
4. Fiduciary Trust Building (offices)
5. Trailway's Bus Station
6. Keystone Building (offices)
7. High Street Garage
8. New England Telephone (offices)
9. Western Union Building (offices)
10. The Travelers' Building (offices)
11. State Street Bank Building (offices)
12. Meridien Hotel
13. Batterymarch Building (offices)
14. 88 Broad Street (offices)
15. Small mixed-use buildings
16. Grain Exchange (offices)
17. Wharf buildings (offices)
18. 60 Broad Street (offices)
19. 33 Broad Street (offices)
20. One Liberty Square (offices)
21. One Post Office Square (office tower)
22. 53 State Street (office tower)
23. 60 State Street (office tower)
24. Downtown Crossing (Filene's, Jordan Marsh, Lafayette Place, etc.)
25. Shawmut Bank Building (offices)
26. Bank of Boston (offices)
27. St. Anthony's Shrine
28. MBTA Operations Center
29. Fort Hill Fire Station
30. Fort Hill Garage
31. John McCormack U.S. Post Office and Court House
32. Angell Memorial Park
33. Kilby Street Garage
34. Old South Meeting House
35. Custom House Tower (offices)

Future Uses

36. Fort Hill development site (offices)
37. Essex Street development corridor (offices)

WATERFRONT (See Figure 80)

Existing Uses

1. Harbor Towers (condominiums)
2. Mercantile Wharf Apartments
3. Christopher Columbus Plaza (elderly housing)
4. Ausonia Apartments (elderly housing)
5. North End Community Nursing Home
6. Faneuil Hall Market Place
7. Bostonian Hotel
8. Haymarket (open air market)
9. Long Wharf Marriott Hotel
10. New England Aquarium

Future Uses

11. Parcel D-10 (retail, offices)
12. Blackstone Block rehabilitation (retail, offices)
13. Sargent's Wharf (residential)
14. MBTA Powerhouse (residential)

GOVERNMENT CENTER (See Figure 80)

Existing Uses

1. Bank of New England Building (offices)
2. Commercial office buildings
3. Sears Crescent (offices)
4. New England Telephone - Bowdoin Square Building (offices)
5. Commercial office buildings
6. Jewish Social Services Building
7. Boston City Hall
8. Veteran's Administration Outpatient Clinic
9. City Hall Plaza
10. John F. Kennedy Federal Building (offices)
11. Boston Police Station, District A
12. Government Center Parking Garage
13. Mass. Dept. of Social Services
14. State Service Center (Hurley Building and Lindemann Center)

Future Uses

15. Parcel 7 (hotel, retail)
16. New Chardon/Merrimac Street parcel (future use unknown)

NORTH END (See Figure 80)

Existing Uses

1. Casa Maria (elderly housing)
2. Thatcher Street Housing
3. McLaughlin Building (condominiums)
4. Battery Street Condominiums
5. Salem, Hanover and connecting streets (retail and restaurants)
6. 77 North Washington Street (commercial)
7. 123 North Washington Street (offices)
8. Copps Hill Cemetery
9. Old North Church and Museum
10. Paul Revere House
11. U.S. Food and Drug Administration
12. Coast Guard Support Center

Future Uses

13. Waterfront Terraces (residential)

NORTH STATION (See Figure 80)

Existing Uses

1. Boston Garden
2. Anelex Building (offices)
3. Atlantic Lobster building
4. Hoffman Building (offices)
5. H.W. Powers Factory Store
6. Francesco's Italian Restaurant
7. Joey's Auto Village
8. Braman, Dow and Company (manufacturing)
9. New England Store Fixtures (warehousing)
10. Keany Square Building (manufacturing)
11. Stop and Shop Bakery
12. Charles River Building (manufacturing, offices)
13. Boston Edison Steam Plant
14. Massachusetts Rehabilitation Hospital
15. Mass. Registry of Motor Vehicles/Dept. of Public Works
16. MDPW helicopter pad
17. North Station Commuter Rail Terminal
18. Government Services Administration Federal Building
19. MBTA Electric Substation
20. Charles River Dam and Locks

Future Uses

21. MBTA Substation
22. Parking Garage
23. Office Building
24. New Arena
25. Mainland development site, BRA Sub-area II (hotel, retail)
26. Canal and Island development site, BRA Sub-area II (residential, institutional)
27. Relocated MBTA Green Line and Commuter Rail Facilities

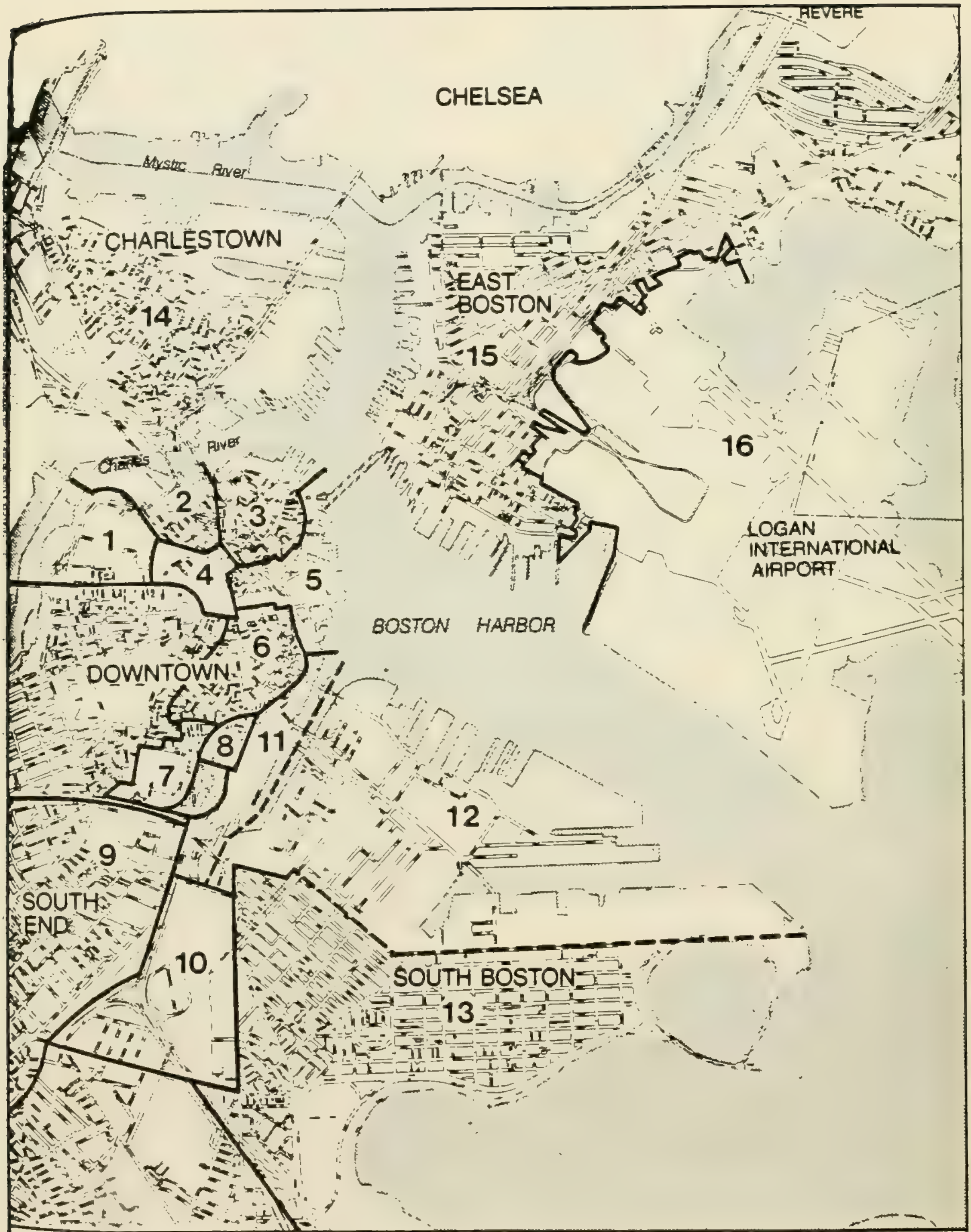
WEST END (See Figure 80)

Existing Uses

1. Amy Lowell House (elderly housing)
2. Charles River Park (residential)
3. The Blackstone (elderly housing)
4. Holiday Inn
5. Charles River Plaza (retail)
6. 50 Staniford Street (offices)
7. Massachusetts Eye and Ear Infirmary
8. Massachusetts General Hospital
9. Shriners Burns Institute
10. Harrison Gray Otis House
11. Suffolk County Jail

Future Uses

12. Charles River Park parcel (future use unknown)



1 - West End
2 - North Station
3 - North End
4 - Government Center
5 - Waterfront
6 - Financial District
7 - Chinatown South Cove
8 - Leather District
9 - South End
10 - Industrial Triangle
11 - Fort Point Channel
12 - S. Boston (Industrial)/ Fort Point Channel
13 - S. Boston (Residential)
14, 15, 16 - Identified on Map

Figure 79
Neighborhoods in the Project Area

0 900 1800 3200 Feet

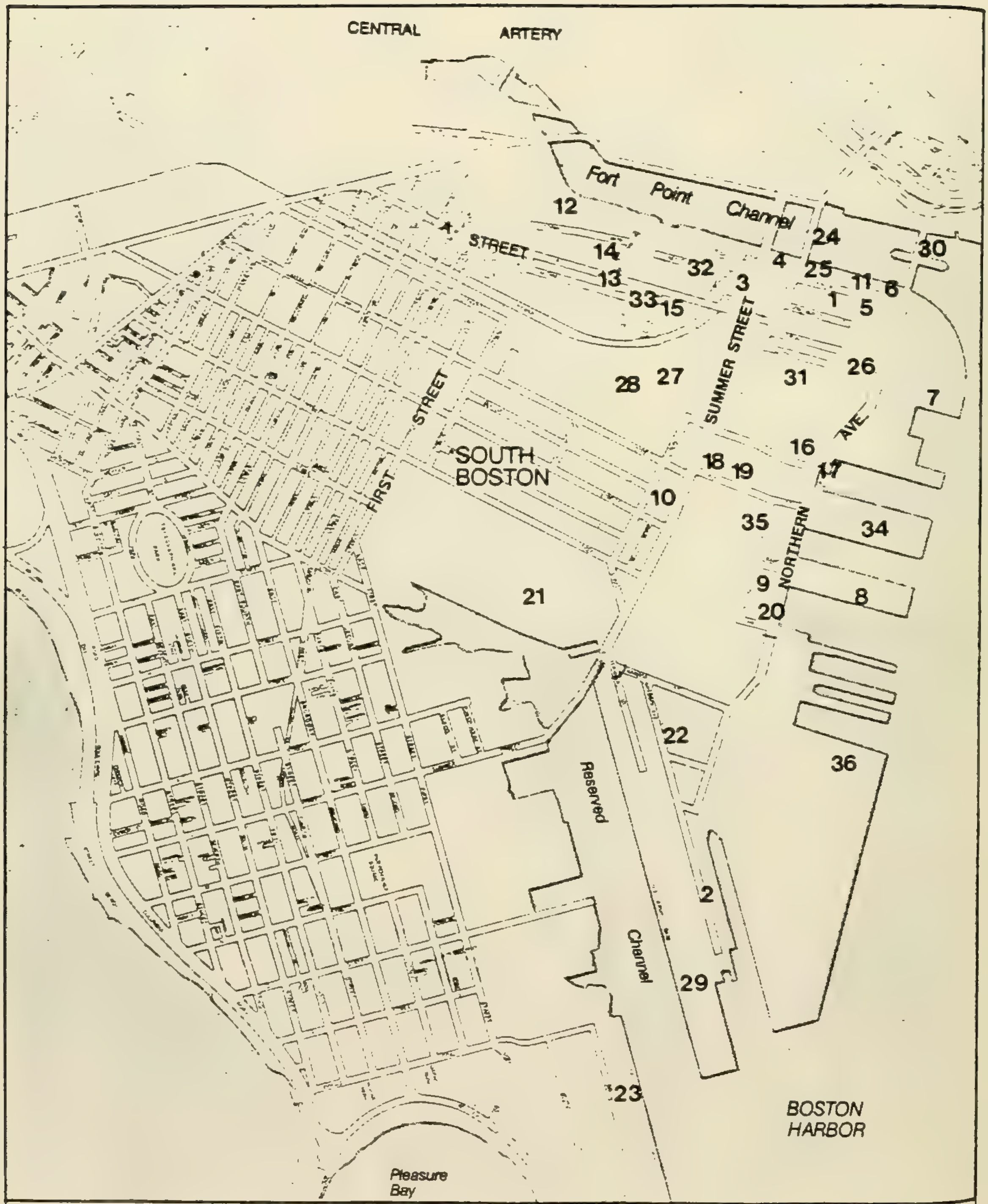
EIS EIR for I-90–Third Harbor Tunnel I-93–Central Artery

Figure 80
Major Land Uses

0 350 700 Feet

EIS/EIR for I-90 Third Harbor Tunnel I-93 Central Artery

Legend
1 Land Use Identified in Text
— Neighborhood Boundaries



1 Land Uses Identified in Text

Figure 81
Major Land Uses – South Boston

EIS/EIR for I-90 – Third Harbor Tunnel; I-93 – Central Artery

strong Italian identity. Non-residential uses are primarily ground floor retail establishments and restaurants which serve local and regional markets.

The West End houses Charles River Park, a large private apartment complex built in the 1960s and 1970s. The other major uses in this area are large health care facilities including the Massachusetts General Hospital.

The Central Artery is a significant land use component of downtown Boston. The structure of this highway in many instances defines the edges of neighborhoods, and land uses on either side of the Central Artery are quite different. In some cases the physical presence of the Artery has slowed changes which were encouraged by the city, for example, the development of the waterfront south of the Harbor Towers. In other areas, the Central Artery is perceived and commonly cited as protecting the character of an area where change is viewed ambiguously, for example, in the North End.

3.2.2 South Boston/Fort Point Channel

The inventory of land use prepared for the DEIS/DEIR treated South Boston and Fort Point Channel as two distinct areas. This Supplemental DEIS/DEIR includes a South Boston tunnel alignment (Alternative 5A) which runs across the southern part of the Fort Point Channel area and through the northern, industrial section of South Boston. For assessing the land use impacts of Alternative 5A, all of the area east of Fort Point Channel and north of First Street has been treated as one district (see Figure 81).

For those portions of South Boston and Fort Point Channel outside this new zone, the discussion of land use has been included in the DEIS/DEIR.

The South Boston/Fort Point Channel area is one of the most important districts for future residential, office, hotel and industrial development in Boston. Both renovation of existing structures and development of vacant sites is occurring. Although some development is taking place despite access problems, improvement of access within and to the area is a key ingredient to continued development interest.

As described in the DEIS/DEIR, the area immediately to the east of the Fort Point Channel contains a mix of land uses and is slowly changing from an industrial to a commercial and residential area. There are approximately 100 existing residences near Fort Point Channel; these include both developer-financed condominiums and artists' lofts. In addition there are many small businesses, including light industrial, commercial and office establishments in this area. The Gillette Company, a research and manufacturing firm with 3,200 employees, occupies a 21-acre site near the Fort Point Channel.

The Boston Wharf Company has substantial land holdings in this area and plans residential and office development. Stone & Webster Engineering Corporation is currently converting a warehouse structure into office space for 900 employees. Cabot, Cabot & Forbes plans to develop former Penn Central properties into a major office site. Piers 1-4, owned by Anthony Athanas, are the proposed site for 1.7 million square feet of offices, two hotels, residential development and a major marina.

Massport is a major land owner in South Boston. Plans for Massport property include a Computer Trade Center on Commonwealth Pier (BOSCOM) and nearby parcels; long-range plans for light industrial and office use on Commonwealth Flats; expansion of fish processing on the Fish Pier; and a container port at the Massport Marine Terminal, under lease from the Economic Development and Industrial Corporation of Boston (EDIC). The Boston Marine Industrial Park, a 101 acre area to the east of the Fish Pier (formerly the South Boston Naval Annex), is also under EDIC

Source: "Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93" Supplement to the Draft Environmental Impact Statement/Report dated June, 1983.

jurisdiction, and contains industrial and marine-related uses. Across the Reserve Channel and to the east of Commonwealth Flats is the Castle Island industrial area, including the White Fuel storage and fuel transfer facility, a major generator of hazardous cargo truck traffic.

3.2.3 Financial District

The Financial District lies between Boston's downtown retail district to the west and the Central Artery to the east. It is the banking and financial center for the Boston metropolitan area and, to a large extent, for New England. The Financial District covers approximately 40 square blocks and consists of multi-story office buildings, with first floor retail activities.

The Financial District comprises two fairly distinct zones separated by the High Street exit ramp from the Central Artery.

One area, centered on Federal and Franklin Streets, is composed of new high-rise buildings occupied primarily by banking, insurance and related firms. Continued development of new office towers and renovation of existing buildings is occurring in this area. The largest site currently under consideration for development is the Fort Hill Garage site, where one to two million square feet of office space have been proposed. This zone also includes the new Meridien Hotel and Devonshire Towers, the first residential development to occur in the Financial District.

The second area, centered around Broad Street, is characterized by five- to six-story buildings and an irregular street pattern. The Broad Street area was originally laid out by the architect Charles Bulfinch and contains many attractive commercial buildings from succeeding periods. The Custom House National Register Historic District is located within this area and includes State Street, the original main street of commercial Boston. Significant recent rehabilitation has taken place in this area, and many of the older buildings now house prime office space.

Downtown Crossing, Boston's retail core, is adjacent to the Financial District. Lafayette Place, a major retail and hotel development now under construction (225,000 square feet of retail space), will open in 1984.

3.2.4 Waterfront

The Waterfront is a recently redeveloped commercial, office and residential area. Faneuil Hall Market Place and the New England Aquarium draw substantial tourist traffic to the area. Renovation activities began in 1964, when the Waterfront was designated as an urban renewal area. Waterfront property is now extremely valuable, and most recent development has focused on luxury commercial and residential markets.

West of the Central Artery the district is occupied by Faneuil Hall Market Place and the Blackstone Block. Buildings are primarily historic three- to five-story brick or granite structures. Faneuil Hall Market Place attracts 12 million visitors per year and is a major retail center. Adjacent to the Market is Boston Redevelopment Authority (BRA) Parcel D-10, a surface parking lot soon to be developed for office and retail uses. Recent developments in the area include the 153-room Bostonian Hotel and a 680-car garage. The Haymarket area along Blackstone Street houses fresh food specialty shops, and is the site of an open air market on Fridays and Saturdays. A pedestrian tunnel crossing under the Central Artery links Haymarket with the North End.

The area lying between North Street, the Central Artery and Atlantic Avenue is composed of four- to six-story brick and granite buildings which are primarily residential. Two large housing developments for the elderly and a nursing home serving North End

Source: "Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93" Supplement to the Draft Environmental Impact Statement/Report dated June, 1983.

residents are also located in this area.

East of Atlantic Avenue are a series of wharves occupied by commercial, office and residential uses. Cruise, ferry and private boats dock at a variety of wharf locations. Christopher Columbus Park is a large park heavily used by Boston residents and tourists. The buildings on the wharves south of Long Wharf (State Street) are relatively new, and include the Harbor Towers condominium buildings and the New England Aquarium. South of Harbor Towers is the BRA's vacant Rowes/Fosters Wharf. Development proposals for this site include office, retail and residential uses.

North of Long Wharf, and continuing to Union Wharf, the wharf buildings are mostly three- to four-story 19th century granite warehouses which have been converted to commercial, office and luxury residential space. North of this area non-residential uses, including the Bay State Lobster Company, currently predominate. Two residential development sites are under preliminary discussion; Sargent's Wharf, owned by the BRA, and an MBTA Powerhouse under discussion for rehabilitation as low cost housing by the Boston Archidiocese.

3.2.5 Government Center

Government Center contains the majority of the City of Boston's public offices, the major Federal office buildings in Boston, and a number of state and county offices. The functional area of Government Center extends across Cambridge Street to include the Suffolk County Courthouse and several state office buildings. In addition to government offices, there are several large private office buildings, parking facilities, and small shops and, restaurants which serve the areas workers. There are no residential structures in the district.

The physical layout of the area is quite different from most of Boston, with wide, heavily travelled streets bordering large "superblocks." The most significant landmark in the area is City Hall Plaza, which is both the major pedestrian circulation space in the district and the site of public demonstrations, performances, and city events.

Boston City Hall, the State Service Center and the JFK Federal Office Building draw a great number of visitors to the area each day, many of whom are unfamiliar with their surroundings. Limited parking facilities cause many people to use public transportation; the Government Center MBTA Station serves area employees, people making business trips, and a significant number of tourists visiting the historic downtown and Waterfront areas.

There are two publicly-owned vacant development parcels in this area; BRA Parcel 7, designated for hotel development, and the parcel at the intersection of Merrimac and New Chardon Streets (no designation for its use has been made).

3.2.6 North End

Directly north of the Waterfront and bounded by the Central Artery, North Washington Street and Boston Harbor lies the North End, one of Boston's oldest neighborhoods. Although separated from downtown Boston by the Central Artery, the North End is within walking distance of Faneuil Hall, Government Center, and the Financial District. Much of the North End is only a short walk from major public transportation services at Haymarket, Government Center and North Station (Green Line, Orange Line, Blue Line, Commuter Rail, bus).

The North End is architecturally homogeneous, with three- to five-story brick buildings lining narrow streets. It is largely residential, but also houses a significant commercial district

Source: "Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93" supplement to the Draft Environmental Impact Statement/Report dated June 1983.

consisting of small shops and restaurants on the ground floors of residential buildings. The district is a major regional center for ethnic shopping, serving the large Italian-American population of metropolitan Boston.

Housing is the primary land use in the North End. At one time, the housing stock consisted primarily of rental units, but there are an increasing number of condominiums. The major commercial section of the North End is located around Hanover and Salem Streets.

Thousands of tourists visit the North End each year to follow the Freedom Trail past Paul Revere's house, the Old North Church and other historic sites.

Located on the periphery of the North End are larger businesses and institutions that are city-wide or regional in character. Expensive professional space has recently been developed on the eastern edge of the North End, essentially as an extension of the Waterfront district.

3.2.7 North Station

The North Station area lies between the Charles River, the Central Artery and Government Center. It contains retail, commercial, government, office, institutional and manufacturing uses. Major facilities are the MBTA's North Station commuter rail terminal and transit facilities, the Boston Garden sports arena, the Anelex Building, the Massachusetts Registry of Motor Vehicles and Department of Public Works, and theMassachusetts Rehabilitation Hospital. Commercial, retail, manufacturing and office uses are concentrated along Causeway Street.

The Bulfinch Triangle lies south of Causeway Street between North Washington Street and Merrimac Street. Its three- to nine-story brick buildings contain primarily manufacturing, commercial and warehousing uses. Private rehabilitation of buildings in this 19th century industrial district is ongoing.

The North Station area presently contains a great deal of land used for surface parking; approximately 2,300 parking spaces exist. Roughly 60 percent of these are designated employee parking for the Massachusetts Department of Public Works, Massachusetts General Hospital, and the Massachusetts Rehabilitation Hospital.

At this time, the Boston Redevelopment Authority (BRA) is undertaking a federally-assisted urban renewal project in the North Station area. Recent planning studies have divided the area into three sections: Railyard and River Edge; North Station/Boston Garden Area; and Bulfinch Triangle. Redevelopment is currently in progress for the North Station/Boston Garden section (BRA Sub-area I), including site preparation for construction of a major General Services Administration (GSA) Federal Office Building. Other potential improvements in this area include relocation of the MBTA Green Line transit facilities; construction of a new Boston Sports Arena or other facility above extended MBTA commuter rail tracks; construction of a parking garage adjacent to Lomasney Way and the elevated Storrow Drive/Central Artery Connector Ramps; and discontinuance of a portion of Nashua Street (part of the GSA project). Construction of these improvements is expected to continue over the next decade. Planning is underway for the Railyard/River Edge section (BRA Sub-area II), with construction of any improvements not anticipated until 1990 or later.

3.2.8 West End

The West End lies between Beacon Hill, the Charles River, and Government Center. Until the late 1950's, the West End was composed primarily of early 20th century five-story apartment buildings. These low-rent buildings were razed in the

Source: "Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93" supplement to the Draft Environmental Impact Statement/Report dated June, 1983.

early 1960s during one of Boston's earliest and largest urban renewal projects. The 45-acre site is now occupied by Charles River Park, a development consisting of eight high rise apartment towers, a subsidized apartment tower for the elderly, an office building, a small commercial building, a synagogue and three parking garages. Landscaped paths wind through the development, and no through streets cross the area.

South of Charles River Park, the area has primarily institutional uses, including Massachusetts General Hospital, Massachusetts Eye and Ear Infirmary, the Suffolk County Jail and two churches. Charles River Plaza, a shopping center along Cambridge Street, contains stores, movie theaters, restaurants, a major hotel and a large privately-owned parking area. There remain a few five-story residential buildings with commercial uses on the ground floor in this area.

There is one undeveloped parcel at Charles River Park at the intersection at Lomasney Way and Staniford Streets; no proposals are under consideration at this time. The remainder of the West End is fully developed.

3.2.9 Charlestown

Existing conditions in Charlestown are described in the Final Environmental Impact Statement for the North Area project (Federal Highway Administration and Massachusetts Department of Public Works, 1979). Charlestown is a stable residential community. The housing stock is predominantly older, two- and three-story structures, with many multi-family and row houses. Charlestown is also a major employment center, with industrial and warehousing activities located to the west of Interstate Route 93, along Rutherford Avenue, and along the Waterfront. Bunker Hill Community College is also located in Charlestown, north of the John F. Gilmore Bridge and east of Interstate Route 93. There are local commercial establishments along Bunker Hill Street and Main Street. Several historic sites, including the USS Constitution and the Bunker Hill Monument, attract visitors to the area.

3.3 NEIGHBORHOOD CHARACTERISTICS AND COMMUNITY FACILITIES

This section describes the major characteristics and significant community facilities of the Waterfront, Government Center, North End, North Station and West End neighborhoods. The City of Boston is used as a baseline for discussion of demographic characteristics. As for land use, these areas comprise the areas of potential additional effects of Alternatives 3A, 5A, 5A Modified, and 6 as compared to the No-Build Alternative and Alternatives 3 and 5 in the DEIS/DEIR. Major community facilities are listed in Table 60 and are shown on Figure 82. Neighborhood characteristics and major facilities are described below.

The neighborhood facilities and characteristics section of the DEIS/DEIR (Section 3.3) should be referred to for comparable discussions of South Boston, Chinatown/South Cove, and East Boston.

Primary sources of information on population and housing are U.S. Census of Population and Housing (1980), the 1979 Boston Redevelopment Authority (BRA) Household Survey and BRA Neighborhood Profiles.

3.3.1 Waterfront

General Characteristics

The Waterfront has been a residential community since urban renewal projects began in the late 1960s. The Waterfront housing stock consists of newly constructed apartments and condominiums and older warehouse buildings that have been rehabilitated for residential use.

The population of the Waterfront area increased dramatically during the period of redevelopment;

Source: "Third Harbor Tunnel, Interstate 90/Central Artery, Interstate 93" supplement ot the Draft Environmental Impact Statement/Report dated June, 1983.

2.0 TRAFFIC FORECASTING PROCEDURE

"THIRD HARBOR TUNNEL PROJECT, INTERSTATE
90" DRAFT ENVIRONMENTAL IMPACT STATEMENT/
REPORT DATED DECEMBER, 1982

2.0 TRAFFIC FORECASTING PROCEDURE

2.1 General

In contemporary practice, traffic forecasting for large highway projects is generally done through use of a computerized traffic analysis procedure known as traffic assignment. This procedure has been developed by the Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration (UMTA) over the past 25 years, and is used throughout the world. In this procedure, a computerized representation of the highway network is constructed. This network, consisting of highway links (streets) and nodes (intersections), covers the area of analytical interest and usually includes most highway facilities other than minor local streets. Associated with this network is a system of zones covering the same geographical area. A trip table, or matrix of trips, that identifies zone-to-zone vehicular flows is prepared as part of this process. In the traffic assignment procedure, vehicular trips from the trip table are assigned to links in the highway network. This is done by using one of several mathematical computer programs or algorithms that assign vehicles from origin zones to destination zones via minimum time paths.

There are usually several stages of analysis in the transportation planning process. In the first stage, a travel survey is taken. This identifies the zone-to-zone flows of trips. Associated with this travel survey are traffic counts made at various points throughout the highway network. These two types of data together constitute what are known as the base case trip table and base case traffic volumes.

The second stage of analysis is traffic assignment model calibration. In this stage, traffic assignments are performed, assigning the trips from the trip table to the computerized highway network. These traffic assignments use the computer programs developed by the FHWA and UMTA. In these assignments, trip table volumes and highway network characteristics are adjusted until assigned volumes on the computerized network are close to the volumes of traffic actually counted. Following this procedure the base case model is said to be calibrated.

In the third stage of analysis, future networks and trips are developed. The highway network is altered to incorporate changes anticipated by the horizon year of analysis, and separate versions of the network are prepared that include the various project alternatives to be tested. Parallel to this work, projections of future trip volumes are made. These projections are based on such factors as growth of future population and employment. From the projections come trip tables for future years.

When the future networks and trip tables are complete, the future trips are assigned to the future networks. These assignments yield the traffic volumes associated with the various plan alternatives. From these assignments, various statistics are available. These include traffic volumes and speeds by link or in total for the network, vehicle hours, vehicle miles, and a variety of other statistics. These various statistics are used in evaluating the proposed alternatives.

Once the basic traffic assignments have been undertaken, a number of subsidiary analyses may be performed. These may include analyses of such issues as vehicle turning movements at intersections, truck traffic, traffic in small areas or on particular streets, and construction staging. These all contribute to the overall evaluation of traffic associated with project alternatives.

In the Third Harbor Tunnel EIS/EIR traffic analysis, the traffic assignment procedure described above has been followed. Base case and future networks and trips were

Source: "Third Harbor Tunnel Project, Interstate 90" Draft Environmental Impact Statement/Report dated December, 1982.

developed (or used from earlier studies); traffic assignments were performed; and, a number of subsidiary and follow-up analyses were undertaken. In the remainder of this section, the specific parts of the analysis are discussed in order as follows:

1. Travel and Traffic Data
2. Base Case Networks and Zones
3. Base Case Trip Tables
4. Base Case Traffic Assignment Model and Model Calibration
5. Future Trips
6. Logan Airport Trips
7. Future Networks
8. Future Assignments
9. Manual Assignments: East Boston and South Boston
10. Truck Volumes
11. Construction Staging
12. Induced Traffic

The following general discussion is intended to provide an overview of the analysis. For specific details of the analysis, technical memoranda are available from CTPS. They are referenced at the end of this Appendix.

2.2 Travel and Traffic Data

The basic source of travel and traffic data used for the Third Harbor Tunnel EIS/EIR is the Boston Central Artery 1977 Origin-Destination Study prepared for the Massachusetts Department of Public Works (MDPW) [1]. In this study, travelers crossing a cordon line around downtown Boston were surveyed with regard to the origins and destinations of their trips. This survey provided travel information for trips to and through the downtown Boston area. Data from this survey had earlier been combined with regional travel data from the 1963 Boston origin-destination survey [2], updated to 1975 [3], to create the regional trip tables that were used for 1977 average weekday traffic (AWDT) assignments in the Corridor Planning Study for Rt. I-93 and I-90: The Central Artery and Third Harbor Tunnel [4]. These same data are the basis for the trip tables that have been used for AM peak, PM peak, and average weekday daily traffic (AWDT) assignments for the Third Harbor Tunnel traffic analysis.

Traffic counts for the 1977 base case assignment model calibration came from a number of sources [5]. These include cordon counts and arterial street counts from the Central Artery Origin-Destination (O-D) Survey, supplemental counts performed for the O-D Survey by the MDPW, counts from the 1974 Boston Cordon Count [6], counts from the Seaport Access Study [7], counts from permanent MDPW counting stations, MDPW coverage counts, and special MDPW counts conducted as part of this study. For model calibration, a total of 159 count locations were used for an "inner" area in and around downtown Boston, and 114 in an "outer" area extending about 4 to 5 miles from the Boston core. Another 62 counts were used for an outer fringe area which extends to just beyond Route 128.

In addition to counts, balanced expressway volumes created by CTPS were used for model calibration.

2.3 Base Case Networks and Zones

The highway network initially used for 1977 AWDT traffic assignments and used in the Central Artery Corridor Planning Study is a large network containing 11,400 links, and stretching to just beyond Route 128. Within the area of coverage, it includes all expressways, all major arterial routes, and most minor arterial routes. For the downtown Boston area, there is more detail, and most local streets are included.

During the course of Third Harbor Tunnel analysis, a number of changes were made in the initial AWDT network. Speeds and capacities were corrected on a number of expressway links, and network geometry was changed in several locations to better reflect the actual highway network.

Major network changes were made in East Boston and South Boston. In

Source: "Third Harbor Tunnel Project, Interstate 90" Draft Environmental Impact Statement/Report dated December, 1982.

these areas, detailed evaluative work was required for Third Harbor Tunnel analysis, for the original network did not include all the required streets. Thus, the network was made more detailed in both of these areas [8]. The final AWDT network links and nodes for East Boston and South Boston are shown in Figure 2 and Figure 3.

The zone system for the AWDT network covers roughly the same geographical area as the network, extending to just beyond Route 128; boundaries are shown in Figure 4. Initially, the zone system included 217 zones, of which about 60 were within downtown Boston. Because of the detailed evaluation requirements of Third Harbor Tunnel analysis, the initial large zones of East Boston and South Boston were disaggregated into smaller zones [8]. Initially, East Boston had only four zones and South Boston had six. In the final system, East Boston had 17 zones and South Boston had 13. Correspondingly, the final AWDT system had 239 zones. The zones ultimately used in Third Harbor Tunnel traffic analysis for East Boston and South Boston are shown, respectively, in Figures 5 and 6.

For AM and PM peak period assignments, smaller networks and zone systems were used. These networks, containing about 6,900 links, stretch to just north of Revere and Medford, to Arlington, Watertown, and Newton to the west, and to just south of the Neponset River (see Figure 7). Within their geographical area of coverage, the AM and PM networks include the same highway facilities as the AWDT network. As initially developed, these networks had 168 zones. These smaller systems were developed for AM and PM peak period assignments because they are easier to use and are much cheaper in computer time than the much larger AWDT network and zone system. For purposes of Third Harbor Tunnel analysis, they yield results equivalent in quality to those of the larger system.

As with the AWDT network, a substantial number of changes were made in the AM and PM base case networks. Many of these were related to making link capacities and speeds more accurate, and to improving network geometry. Others were made to accomplish the same network detailing in East Boston and South Boston that was done for the AWDT network.

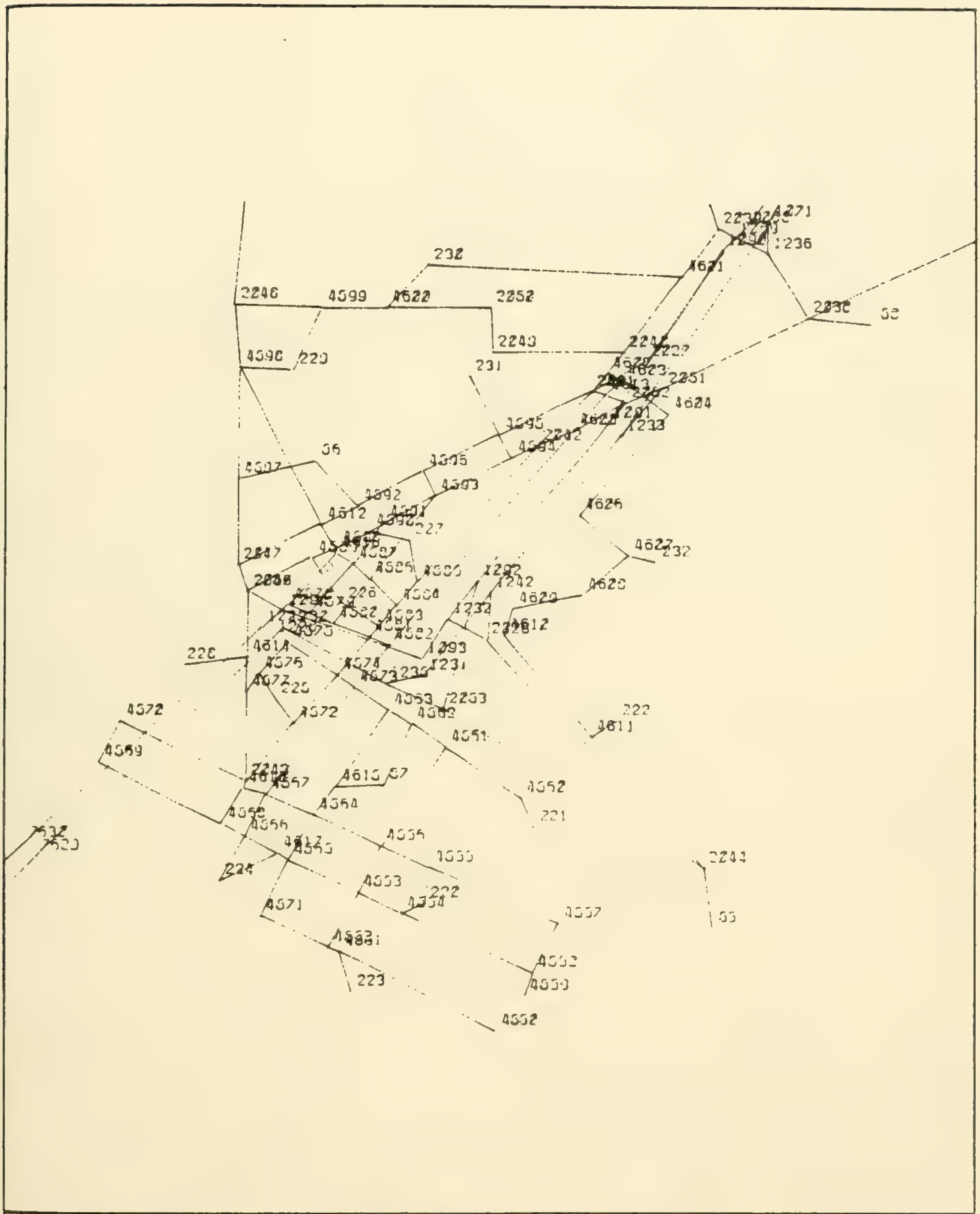
Zone systems for the AM and PM networks were also disaggregated in East Boston and South Boston to the same zones as for the AWDT network. The final AM and PM zone systems include 188 zones each.

2.4 Base Case Trip Tables

As indicated above, 1977 base case AWDT trip tables had previously been prepared and used for AWDT traffic assignments for the Central Artery Corridor Planning Study. For Third Harbor Tunnel analysis, these trip tables were used substantially as they had been developed earlier, except that they were disaggregated in East and South Boston to reflect the smaller zones created in those areas. The disaggregation process involved determining, at a census tract level, the fractions of trips for each original zone that were residentially and non-residentially related, and then aggregating the census tract fractions up to the new zone systems in accordance with the original zonal residential and non-residential trip totals [9, 10, 11, 12, 13, 14, 15, 16]. Trips from the new zones were assumed to be distributed to other zones in the same proportions as had been the case in the original zones.

Prior to the Third Harbor Tunnel analysis, a 1977 base case AM peak trip table had been prepared for 7:00 AM to 10:00 AM using the same data sources as had been used in creating the AWDT trip table. This trip table was used for Third Harbor Tunnel AM peak base case assignments, with its values somewhat modified through the traffic assignment model calibration process. As with the AWDT trip table, a disaggregation process was required for the new smaller zones in East Boston and South Boston [17,

Source: "Third Harbor Tunnel Project, Interstate 90" Draft Environmental Impact Statement/Report dated December, 1982.



— Network Links

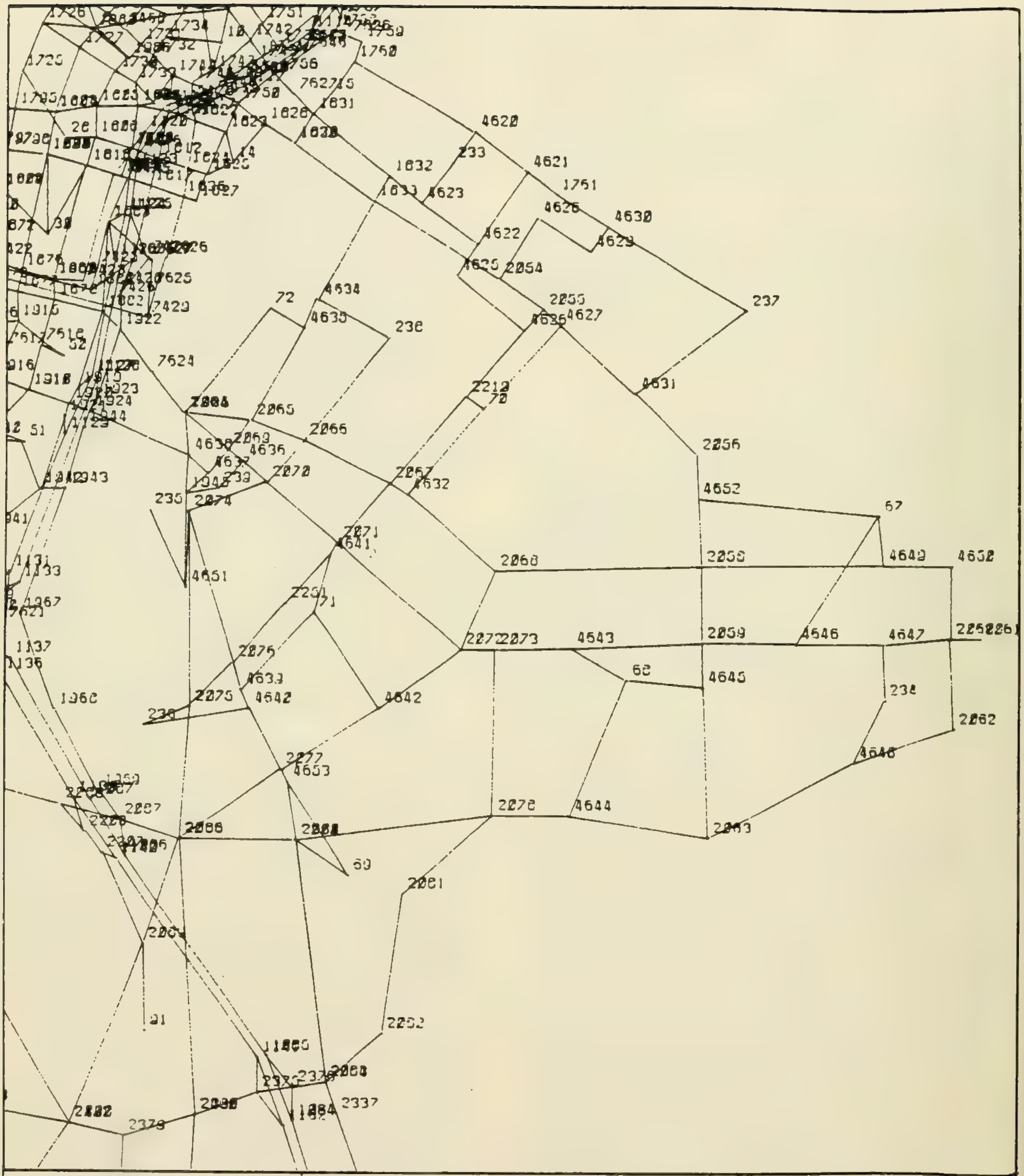
223 Network Nodes

Figure 2

East Boston Links and Nodes Average Weekday Traffic Network

0 1333 Feet

EIS/EIR for I-90, The Third Harbor Tunnel



Network Links

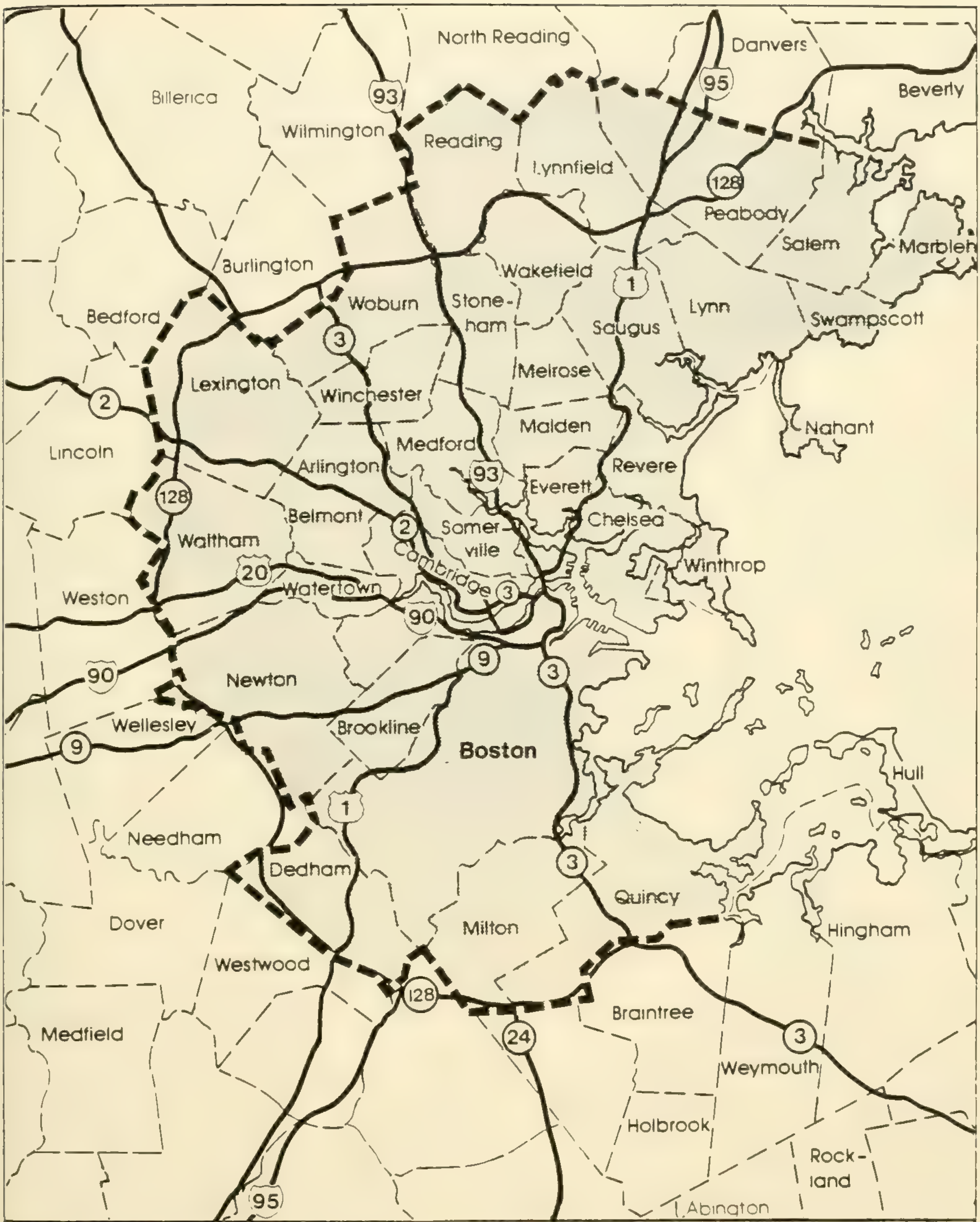
222 Network Nodes

Figure 3

South Boston Links and Nodes
Average Weekday Traffic Network

0 1666 Feet

EIS/EIR for I-90, The Third Harbor Tunnel



Average Weekday Traffic Zone System

Outer Boundary of Average Weekday Traffic Zone System

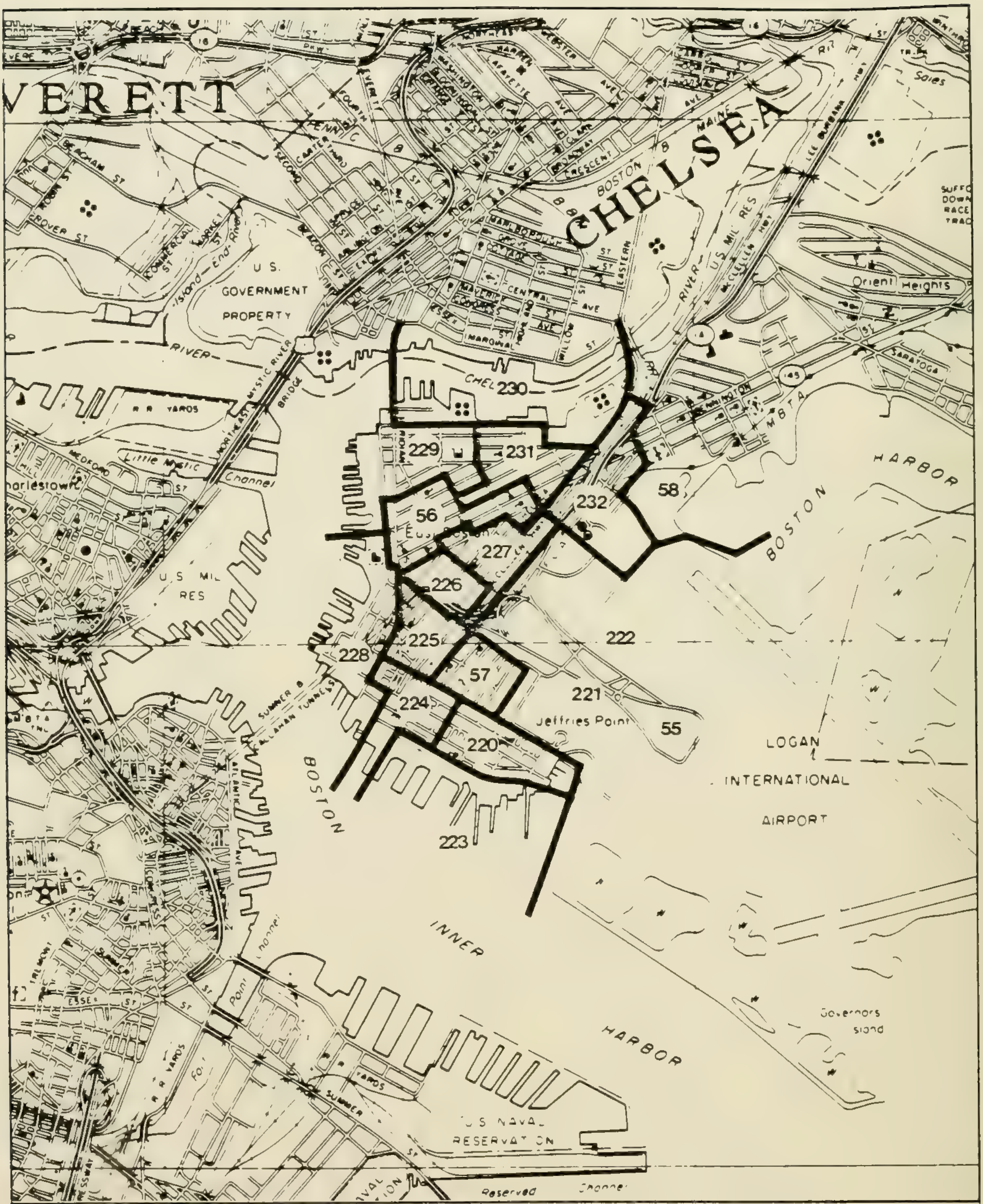
Major Highways

Figure 4

Outer Boundary of Average Weekday Traffic Zone System

0 1 2 4 Miles

EIS/EIR for I-90, The Third Harbor Tunnel



Zone Boundary

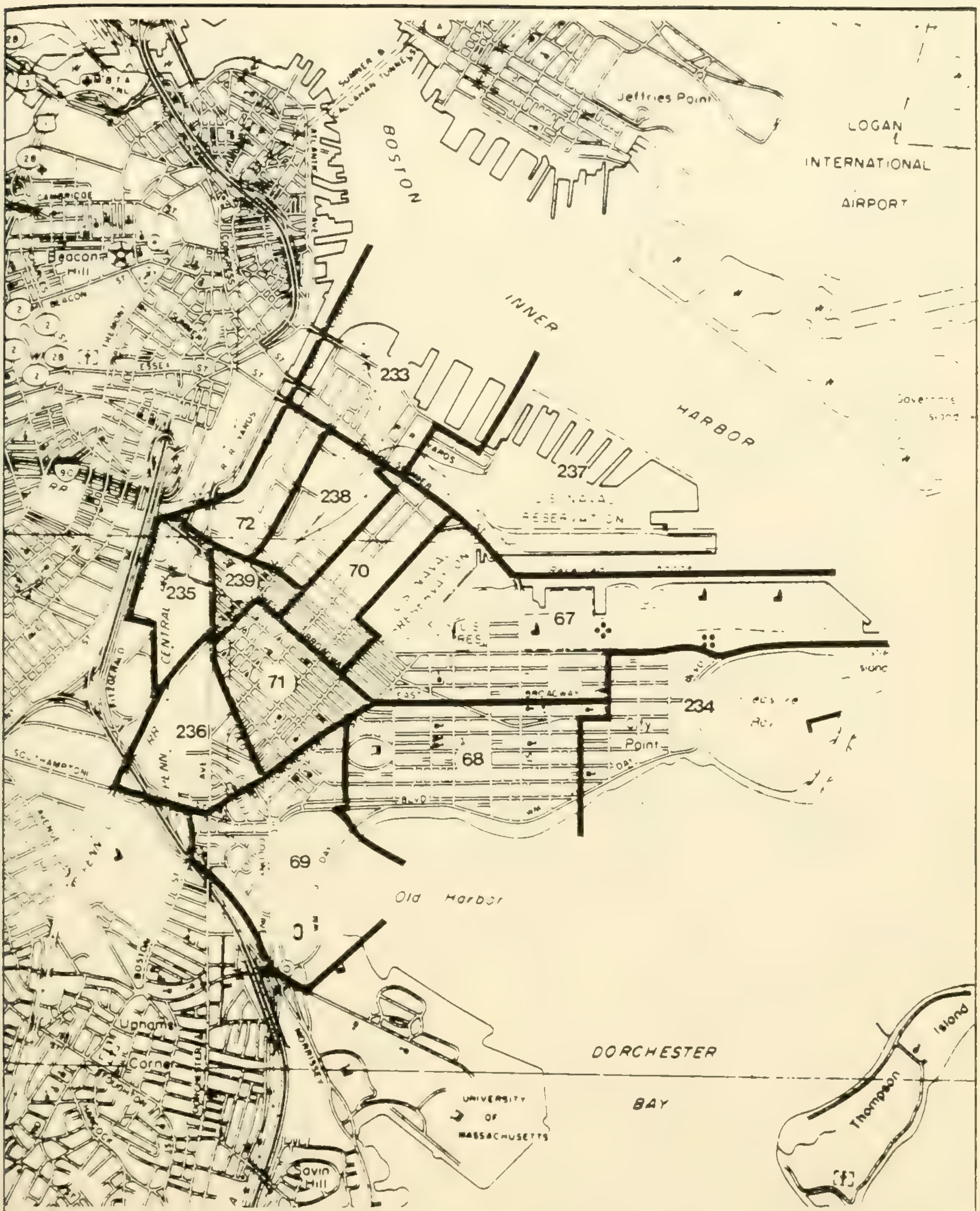
00 Zone Number

Figure 5

East Boston Zone System for Disaggregated Average Weekday Traffic Network

0 ¼ ½ Mile

EIS/EIR for I-90, The Third Harbor Tunnel



Zone Boundary

00 Zone Number

Figure 6

South Boston Zone System for Disaggregated Average Weekday Traffic Network

EIS/EIR for I-90, The Third Harbor Tunnel

Figure 7
Outer Boundary of A.M. & P.M. Peak Traffic Zone System

EIS/EIR for I-90, The Third Harbor Tunnel

18, 19]. This process was analogous to the one undertaken for the AWDT trip table.

Prior to the Third Harbor Tunnel Study, no PM peak period trip table had been created. Such a table for this study was initially developed for 1977 for the PM peak period (3:00 PM to 6:00 PM), by reversing the AM peak base case trip table [20, 21, 22, 23]. This reversal was based on the assumption that trips from Zone A to Zone B during the AM peak go from Zone B to Zone A during the PM peak. The initial base case PM trip table was substantially altered during the model calibration process, in order to account for actual differences between PM peak travel and the reverse of AM peak travel.

For the PM peak base case trip table, a disaggregation process was made for East Boston and South Boston following the same procedure as that used for the AM peak base case trip table.

2.5 Base Case Traffic Assignment Model and Model Calibration

All traffic assignments for Third Harbor Tunnel analysis utilized the Urban Transportation Planning System battery of traffic assignment programs of UMTA. For AWDT, "equal-or-nothing" assignments were run. For AM and PM, "all-or-nothing" assignments were performed. For AWDT assignments, seven iterations were used for calibrating the base case 1977 model. For AM and PM peak period assignments, five iterations were used.

Because the AWDT assignment model was already quite well calibrated from the earlier Central Artery Corridor Planning Study, only a relatively small amount of calibration work was necessary. A total of ten calibration runs were conducted [24]. These runs had three purposes. The first was to compensate for the speed, capacity, and geometric changes that had been incorporated during network editing. The second was to redistribute Logan Airport trips more in accordance with the results of the 1978 Logan Airport Survey [25]. The third was to incorporate the disaggregated zones for East Boston and South Boston.

An extensive process of calibration was undertaken for both the AM and the PM traffic assignment models. For the AM peak, a total of twenty-eight traffic assignment trials was undertaken in model calibration [26]. These trials had a variety of purposes ranging from bringing corridor traffic volumes into conformance with counts, to adjusting Logan Airport trip totals and distributions to agree with survey results. For the PM peak, a total of twenty model calibration runs were undertaken [27]. They had purposes roughly parallel to those of the AM peak. For both the AM peak and PM peak, disaggregation was done for zones in East Boston and South Boston. A portion of the graphical computer output from a typical model assignment is illustrated in Figure 7.

2.6 Future Trips

It was originally anticipated that future trips for AM, PM, and AWDT would be based on CTPS Interim Projections of 1977 extended to the Third Harbor Crossing horizon year of 2010 [28, 29]. An early analysis of the difference between CTPS Interim Projections and new projections based on the 1980 Census [30], however, indicated that new projections based on the 1980 census were much lower than the earlier ones. Because the difference was considerable, it was decided to use new projections based on the 1980 Census. For this purpose, Metropolitan Area Planning Council (MAPC) projections of population and employment growth [31, 32] were converted from the town level projections of MAPC to the zone system of CTPS [28, 29, 33, 34]. These projections were then applied to the base case trip tables of 1977 in order to create trip tables for 1990 and 2010.

Because of the desire for more

Source: "Third Habor Tunnel Project, Interstate 90" Draft Environmental Impact Statement/Report dated December, 1982.

accuracy of traffic assignments in East Boston and South Boston, special attention was paid to future population and employment factors in those areas. Census tracts in East and South Boston were examined individually, and forecasts were made and then aggregated to the zone level. Planned developments such as those on the Massport and Athenas properties in South Boston were specifically considered [35, 36]. The growth factors from these projections were incorporated into the 1990 and 2010 trip tables.

2.7 Logan Airport Trips

Because of the considerable importance of Logan Airport trips in future harbor crossing volumes, special care was devoted to Logan Airport trips both for the base case and for future trips. As indicated above, under base case model calibration, Logan trips were redistributed to agree with existing travel patterns [37]. For projections of future Logan trips, the following procedure was undertaken. First, base case traffic was broken down by activity: air passengers, employees, and air cargo, for the airport survey year of 1979 [38]. Then the proportions of traffic for each activity were applied to the 1977 base year traffic [39]. Following this, a new forecast of Logan air traffic prepared by Massport [40] was combined with a specific forecast for Bird Island Flats activity [41], to create projections of ground traffic to Logan Airport for the year 2010 [42]. For the 2010 projections, three scenarios were envisioned. In one, it was assumed that travel mode choices to and from the airport would remain much as they are today. In the second, it was assumed that the present trend toward non-private auto modes would continue. In the third, it was assumed that there would be maximum use of public transit. It was decided to use the first scenario for trip tables for Third Harbor Tunnel build alternatives, and the second for the No-Build Alternative, reflecting the potential effect of the project on mode choice. Ultimately, 1990 trip projections were made using these same assumptions [43].

2.8 Future Networks

Future networks were constructed for the No-Build alternative and the four Third Harbor Tunnel build alternatives. All future networks were based on the so-called "L-2" network for the Central Artery North Area Project, and included future committed projects, such as widening of the Southeast Expressway, construction of the Seaport Access Road in South Boston, and construction of the Southwest Arterial. The Revere Beach Connector and the Salem-Peabody Connector were not included in the future networks. The 1990 future networks were the same as those for 2010.

2.9 Future Assignments

For future AWDT, multiple sets of assignments were run. Following the first set of assignments [44], certain anomalies were noted in some of the volumes. After an extensive network check and certain network corrections, a second set was run [45]. This second set of assignments was much better, and was used for Third Harbor Tunnel AWDT traffic volumes.

For AM and PM traffic, multiple sets of assignments were also run. Four test sets of AM assignments were performed [46], and then production sets of AM and PM assignments were run [47, 48, 49, 50]. In analyzing the results of these production assignments, it was found that the results were distorted in certain areas where main routes compete with alternative routes [51]. This occurred because of inadequate numerical convergence of the assignments. Thus, the production assignments were rerun using nine rather than five iterations [52, 53] of the assignment algorithim. The results of this second set of production assignments were much better than those of the first set,

Source: "Third Harbor Tunnel Project, Interstate 90" Draft Environmental Impact Statement/Report dated December, 1982.

and they were used for Third Harbor Tunnel AM and PM traffic volumes.

For all production assignments--AM, PM, and AWDT--the following were produced for 1990 and 2010 for all five Third Harbor Tunnel alternatives:

1. Traffic Volumes
2. Congested Speeds
3. Turning Movements at forty intersections
4. Total Vehicle Hours
5. Total Vehicle Miles

2.10 Manual Assignments: East Boston and South Boston

Despite model disaggregation in East Boston and South Boston, it was not possible for the computer model to produce accurate traffic assignments for local streets in these areas. This was partly because the traffic zones were still too large to allow accurate volumes on the smallest streets, and partly because detailed model calibration could not be carried out for East Boston and South Boston. It was also because the traffic assignment model cannot replicate queuing behavior, which is a significant factor on local streets.

For these reasons, manual assignments for South Boston and East Boston streets were performed [54, 55, 56, 57, 58, 59]. In performing these manual assignments, base case volumes were taken largely from the 1982 counts collected as part of the Third Harbor Tunnel EIS/EIR. These were adjusted for future years and alternatives by incorporating the differences between the base case computer assignments and the computer assignments for future years and alternatives. Effort was expended to have the manual assignments agree with the machine assignments at the entry points to East Boston and South Boston.

For purposes of these manual assignments, only three alternatives were assigned in East Boston (Alternatives 1, 4, and 5) and three in South Boston (Alternatives 1, 2, and 4). It was assumed that local differences in alternative networks in South Boston would not affect volumes in East Boston and vice versa; e.g., Alternatives 4 and 5 would have the same traffic arrangements in South Boston despite their differences in East Boston.

For all manual assignments, turning movement analyses were performed for 13 intersections in South Boston and fourteen in East Boston. The turning movement analyses were based on the changes in the assignments from the 1982 base to the various years and alternatives. A total of 312 turning movement analyses were thus undertaken.

2.11 Truck Volumes

No explicit truck traffic assignments were performed for the Third Harbor Tunnel EIS/EIR analysis. It was assumed that truck percentages in the future would generally mirror those of today [60]. For entries to and exits from Logan Airport, specific truck projections were made [61]. For East Boston and South Boston, future truck volumes were based on the manual assignment volumes for all vehicles [54, 55, 56, 57, 58, 59].

2.12 Construction Staging

Traffic was assigned for seven construction stages/alternatives. Three of these were for the AM peak and four for the PM peak. For these stages/alternatives, various links in the future highway network were altered or deleted in accord with the roadway changes associated with the given stage and alternative. In the construction staging assignments, no manual adjustments were made.

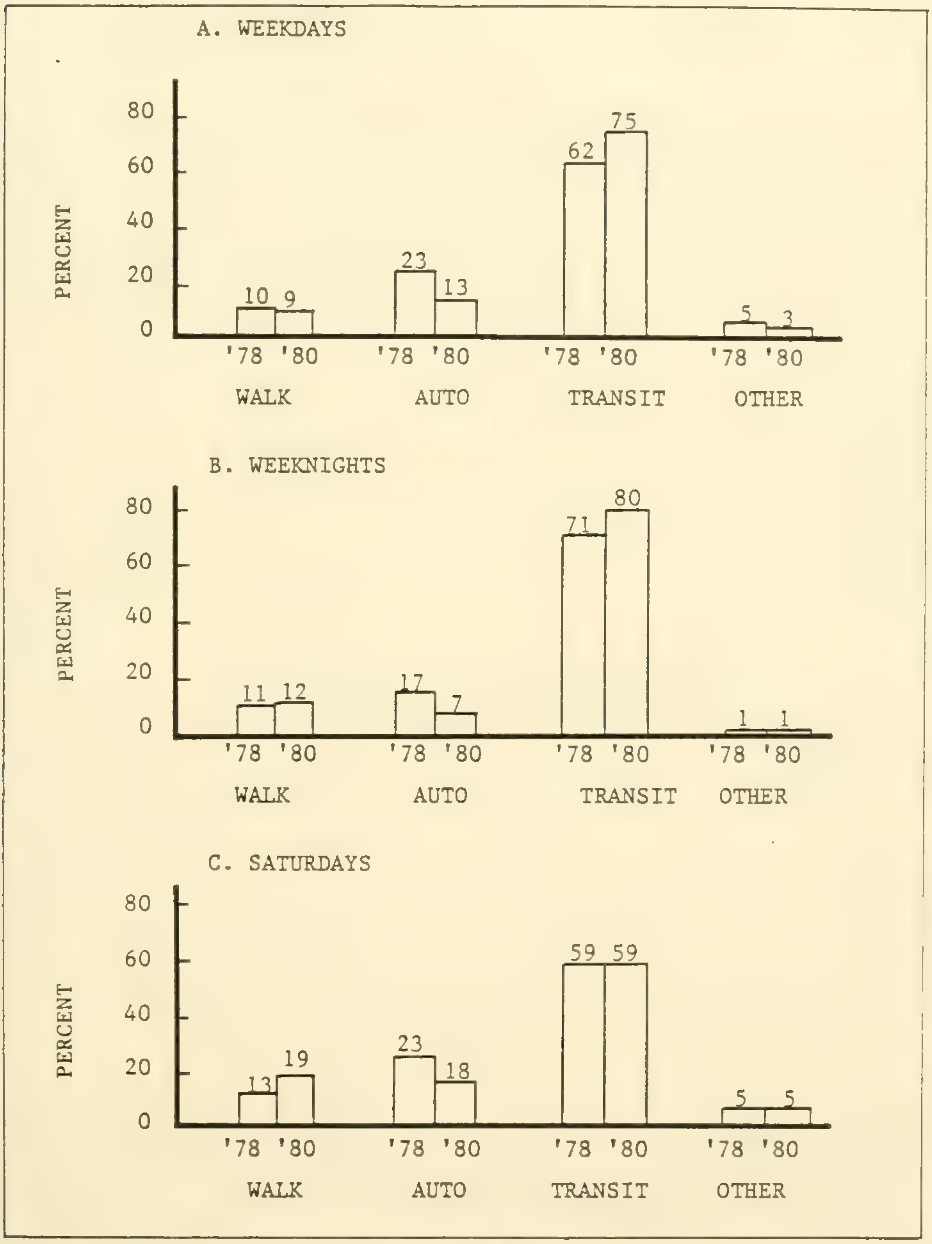
2.13 Induced Traffic

Consideration of induced traffic was limited to analysis of the build alternatives as a group versus No-Build for Logan Airport traffic. As indicated above, it was assumed in the No-Build case that increasing traffic congestion would force Logan

Source: "Third Harbor Tunnel Project, Interstate 90" Draft Environmental Impact Statement/Report dated December, 1982.

passengers into non-private automobile modes, as has been happening over the past decade. For all build alternatives, it was assumed that this shift would not continue to take place. The difference between the traffic volumes associated with the two assumptions could be considered to be "induced" traffic, and amounted to approximately 12,800 trips daily. More accurately, added traffic associated with the build alternatives is traffic growth that would be constrained and could not take place in the No-Build Alternative.

"DOWNTOWN CROSSING: AUTO RESTRICTED ZONE
IN BOSTON" FINAL REPORT DATED JULY, 1982



SOURCE: Pedestrian Interview Surveys, 1978 and 1980

Table taken from "Downtown Crossing: Auto Restricted Zone in Boston" Final Report Dated July, 1982.

FIGURE 8-9. MODE OF TRAVEL TO DOWNTOWN BOSTON

TABLE 8-2. MODE OF TRAVEL TO WORK

	% Share	
	1978	1980
Walk Only	5.4	5.7
Auto Only	23.7	16.7
Subway Only	25.5	28.0
MBTA Bus	9.5	10.9
Other Bus	5.4	5.1
Commuter Rail	10.2	10.0
Taxi	0.4	0.2
Bus to Subway	12.7	14.0
Rail to Subway	0.5	0.6
Auto to Subway	4.7	6.5
Rail to Bus	0.4	0.2
Auto to Bus	0.9	0.8
Bicycle and Miscellaneous	0.6	1.2
	100.0	100.0

Source: Employee Surveys, 1978 and 1980 (29 buildings surveyed in both years). Table taken from "Downtown Crossing: Auto Restricted Zone in Boston" Final Report Dated July, 1982.

"PARKING IN CENTRAL BOSTON: MEETING THE
ACCESS NEEDS OF A GROWING DOWNTOWN"
DATED DECEMBER, 1983

APPENDIX C

Appendix C

Methodology for Projecting Future Parking Demand

Appendix C: Methodology for Projecting Future Parking Demand

Overview

Projections of future parking demand generated by new office, retail, and hotel development were made using a three step process:

- trip generation: application of standard trip rates to planned square footage of development to obtain estimated numbers of daily person-trips generated, by trip purpose (work and non-work).
- modal split: splitting the projected number of trips generated among different travel modes: automobile, transit, and other (walk, bike, etc.)
- turnover: applying turnover rates for work (long-term) and non-work (short-term) trips made by automobile to yield peak parking demand.

Parking demand for new residential developments was estimated based on auto ownership information from the 1970 census. This appendix presents the trip generation, modal split, turnover, and other assumptions employed for the calculations of future parking demand in Chapter 3.

Trip Generation

Table C.1 presents trip generation rates for office, retail and hotel uses. These rates were primarily derived from the Institute of Traffic Engineers' Trip Generation Report, which is based on data collected in a range of US urban areas. The rates shown are for round trips. Each rate is broken down in the table into a work trip generation rate and a non-work trip generation rate according to observed trips per employee ratios (see footnotes to table). This was done to allow the methodology to distinguish between long-term and short-term parking demand.

Modal Split/Auto Occupancy

Once the number of trips "generated" by new development is known, the total number of parkers can be established by determining the proportion of

TABLE C.1

Trip Generation Rates
(Round Person-Trips Attracted Daily)

Office 6/1000 sq ft[A]
- 3.9 work trips[B] (employees)
- 2.1 non-work trips (visitors)

Retail 20/1000 sq ft[C]
- 2.8 work trips[D] (employees)
- 17.2 non-work trips (shoppers and visitors)

Hotels 5/room[D]
- 1 work trip (employees)
- 4 non-work trips (includes multiple guest trips and restaurant visitors)

[A] This is the average trip rate for general offices reported in the National Cooperative Highway Research Program (NCHRP) Report 187, "Quick Response Urban Travel Estimation Techniques and Transferable Parameters" (1977). The original source of this figure is the Institute of Traffic Engineers (ITE) Trip Generation Report.

[B] Given the attraction rate per office square footage and assuming an average rate of 4.6 workers 11,000 square feet for Class A office space (Boston Redevelopment Authority: The Office Industry Survey, Part II, 1979), the member of work trips generated per 1,000 sq. ft. of office is estimated to be 3.9, or 65 percent of all trips generated.

[C] This is the average retail attraction rate for high density central business districts reported in NCHRP Report 187 (based on the ITE Trip Generation Report)

[D] Knowing the total trip attraction rate, the number of work trips per 1,000 sq. ft. can be determined by assuming a rate of 3.2 employees per 1,000 sq. ft, and the standard rule of thumb of 1.7 (one-way) trips/employee/day.

[E] Source: NCHRP Report 187 and ITE Trip Generation Report. The estimate of 1 work trip for every five trips was based on professional judgement.

trips made by automobile and the average number of occupants per automobile. In Boston, the following information on modal split and auto occupancy is available:

a. 1982 Cordon Count (adjusted for through trips--see Chapter Two)

	Percent of daily person-trips (6 am - midnite)
automobile	59%
public transportation	33%
bicycle/walk	8%
auto occupancy: (not adjusted for through trips)	1.33 (6-9 am) 1.42 (6 am - midnite)

b. Building Surveys--(see Appendix B)

		Work Trips				
Zone	Building	Auto	Transit	Other	Auto Occupancy	N
7a	500 Boyston St.	35%	51%	14%	1.90	141
1b	470 Atlantic Ave.	44%	53%	3%	2.02	500
1a	125 High Street	43%	54%	3%	1.72	516
1a	Shawmut Bank	27%	67%	6%	1.67	1,171
1b	Fed. Reserve Bank	38%	57%	5%	2.04	931
	All Buildings	36%	59%	5%	1.84	2,259

		Non-Work Trips				
Zone	Building	Auto	Transit	Other	Auto Occupancy	N
7a	500 Boyston St.	60%	24%	16%	1.72	25
1b	470 Atlantic Ave.	87%	9%	4%	1.52	23
1a	125 High Street	77%	13%	10%	1.29	40
1a	Shawmut Bank	51%	33%	16%	1.35	129
1b	Fed. Reserve Bank	NA	NA	NA	NA	0
	All Buildings	61%	26%	13%	1.40	217

c. Central Transportation Planning Staff (CTPS) 1975 Trip Tables

Zone	Percent of Trips by Transit: home-based work	home-based other	non-home-based
1	45%	26%	13%
2	49	30	17
3	35	17	11
4	38	18	10
5	50	35	17
6	33	16	10
7	38	20	12
8	21	10	6
9	32	17	9
10	25	15	6
11	32	16	9
12	29	16	10
All Zones	41%	17%	12%

d. Fanueil Hall Shopper Survey (Rouse, 1977)

trip origin (weekday)		mode (weekday)	
home	46%	auto	43%
work	21%	transit	16%
tourist	15%	walk/other	35%

e. BRA Office Tenant Survey (March, 1979)

Location	Percent of Work Trips by Auto
Financial District	32%
Government Center	30%
MidTown	33%
Back Bay	40%
All Areas	34%

f. Downtown Crossing Evaluation Building Surveys
(Cambridge Systematics, 1980)

Building	% by Auto
79 Milk	44.4%
100 Federal	40.7
1 Federal	35.5
80 Boylston	32.9
1 Court	31.0
18 Tremont	30.8
100 Summer	28.2
10, 24 Federal	25.9
89 Broad	24.7
1 Washington Mall	24.2
Prudential	23.8
89 State	23.5
City Hall	23.0
230 Congress	21.7
141 Milk	21.4
600 Washington	21.3
60 State	20.7
140 Federal	20.5
185 Tremont	20.0
53 State	19.4
27 School	19.4
10 High	19.0
45 School	18.4
294 Washington	18.0
1 Boston Place	17.0
75 Federal	16.7
99 High	16.7
125 High	16.7
262 Washington	14.3
1 Beacon	14.3
All Buildings	23.7%

Needless to say, there is considerable variation in both modal split and auto occupancy among sources. However, it is clear that modal split varies from area to area of the downtown, according to the level of transit access and parking availability. Based on the available information, together with judgement about relative levels of transit and auto access to the different analysis zones, assumptions about modal split were made for the zones in which new development is projected to occur. These are shown in Table C-2. Auto occupancy was assumed not to vary in a systematic manner by zone, but

in general appeared to be higher for work trips than for non-work trips. Average auto occupancies of 1.51 for work trips and 1.31 for non-work trips were assumed, and are consistent with the all-day average of 1.42 observed in the recent cordon count.

These modal split and auto occupancy assumptions were applied to projected numbers of work and non-work person trips to obtain estimates of the number of total daily parkers. The one exception to this, however was non-work trips generated by new hotels. Instead, peak (non-work) parking demand of .25 spaces per room was assumed, based on judgement.

Turnover

Turnover rates of 1 for work-related parkers and 2.67 for non-work related parkers were assumed, based on national experience.

Residential Parking Demand

Peak parking demand per dwelling unit was calculated based on an auto ownership assumptions derived from the 1970 census of .74 autos per dwelling unit, and an assumption that 75 percent of autos owned by residents would be left at home during the day.

TABLE C.2

Modal Split Assumptions: Percent of Trips by Auto

Zone	Work Trips	Non-Work Trips
1a	35%	27.5%
1b	40	39
2a	35	38.5
3	30	35
4	30	35
5a	30	35
5b	40	42
7a	40	48
7b	45	52
9a	45	52
11b	40	48
12	60	56

Example Calculation of Peak Parking Demand: Zone 9a (1985)

Development:	845,000 sq. ft. office
	300,000 sq. ft. retail
	1,900 hotel rooms
	400 dwelling units

Work-Trips Generated: 845 (3.9) + 300 (2.8) + 1900 (1) = 6036

Non-Work Trips Generated: 845 (2.1) + 300 (17.2) + 1900 (4) = 14,535

Work Trips by Auto: 6036 (.45)/1.51 = 1798

Non-Work Trips by Auto: 14,535 (.52)/1.31 = 5769

Work-Related Parking Demand: 1798/1 = 1798

Non-Work-Related Parking Demand:

$$(14{,}535 - 4(1900))\ (.52)/(1.31)(2.67) + .25(1900) = 1506$$

"PARKING IN CENTRAL BOSTON: MEETING THE ACCESS NEEDS OF A GROWING DOWNTOWN"
DATED DECEMBER, 1983

APPENDIX D

Appendix D

Adapting Boston's Parking Freeze in Response to a Changing Downtown Environment

Contents

1. Background

Instituted in 1976, the present freeze on commercial parking spaces in downtown Boston limits the number of commercial spaces to the 1973 level of 35,503. New construction of commercial spaces can be done only after the Boston Air Pollution Control Commission (BAPCC) issues a freeze permit. Freeze permits are issued contingent on the proposed facility meeting the BAPCC's criteria, which are:

- sufficient spaces are available in the freeze bank. (Spaces are added to the bank when on- or off-street parking spaces are removed in the freeze area);
- the facility will not add parking to an area already adequately served by existing parking facilities or with adequate transit access;
- it will not contribute significantly to peak period traffic;
- it is located and designed so that the surrounding sidewalks and streets are sufficient to accommodate pedestrians and vehicular movements;
- it has satisfactory access to the major highway serving the area;
- it directly serves development in the surrounding area, and
- its design, including height, bulk, ground floor use, and landscaping, is in accordance with and consistent with architectural and land use patterns in the surrounding area and is itself aesthetically pleasing.

All non-commercial spaces, including residential, and reserved employee and visitor spaces are exempt from the freeze. However, the APCC must grant a special exemption before non-commercial facilities may be constructed.

The boundaries of the freeze area coincide with the area termed "Boston Proper". Boston's zoning code, which was revised in 1973 to eliminate minimum parking requirements for all but residential uses, established a Restricted Parking District (RPD), in which non-residential parking would be considered a Conditional Use, subject to Zoning Board of Appeal approval. The boundaries of the RPD include the freeze area, and extend to the medical area in the Fenway, and parts of South Boston and Dorchester down to

Columbia Point. Zoning Board of Appeal conditions on approval of facilities within the RPD include:

- the facility will serve a traffic demand not adequately provided for by public transportation, or
- it will replace existing off-street parking spaces in one or more nearby parking facilities, or it will replace legal on-street parking spaces that have been physically eliminated through permanent modification or elimination, or
- it is accessory and ancillary to a use which by its nature does not contribute significantly to traffic flows during peak traffic periods, or
- the facility constitutes a temporary parking lot use of land and that serious intent to reuse the land for an allowed use within a specified period of time has been demonstrated to the satisfaction of the Board of Appeal.

Thus, Boston has two overlapping mechanisms for controlling new parking construction. While criteria for approval are similar, the freeze provides a much stricter control tool.

2. Impacts of the Freeze to Date

The APCC began administering the freeze in 1976. In 1981, the City of Boston conducted a study[1] to assess its impacts to date. Major findings of this study were:

- The parking freeze has been successful at limiting the number of commercial spaces to the ceiling level of 35,503.
- Employee and other non-commerical spaces increased by 18% between 1973 and 1980 to a total of 20,260 spaces. However, this increase in non-commercial spaces is less than that which occured in the five years between 1968 and 1973 (a 35% increase).
- Downtown development has proceeded at a healthy pace, unimpeded by the freeze. Between 1973 and 1980, over 8 million square feet of office space were completed, and 5 million additional square feet were under construction.

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[1] Ellen Collins, Boston Redevelopment Authority, Transportation Planning Department, "Downtown Boston Parking Programs", prepared for the Traffic and Parking Department, City of Boston, sponsored by the Metropolitan Area Planning Council, July, 1981.

- The parking freeze has been a contributing factor in restraining automobile usage, further encouraging the use of mass transit, and thus keeping air pollution in check. Between 1964 and 1974, automobile travel to Boston proper increased 20% and transit ridership declined by 11%. Between 1973 and 1980, the split between transit and automobile trips to the downtown did not change significantly.

- The parking freeze has been a valuable tool for preventing the proliferation of open lots downtown, and preserving older buildings which may otherwise have been demolished for parking.

3. Changes in the Downtown Environment Since 1973

While the freeze has been very successful at achieving its objectives, a number of changes have occured since 1973 which provide reason for giving serious consideration to modifying the freeze:

- Unprecedented downtown development has occurred, increasing office square footage by 35 percent between 1973 and 1982.

- An additional 6 million square feet of office and retail space are planned to come on line between 1982 and 1985.

- Peak occupancies of downtown parking facilities have increased from 82 percent in 1972 to 93% in 1982. This occupancy level is sufficiently high to trigger concern about meeting the needs of new development, and in particular, the midday parker.

- Presently, more than 5000 cars are parking in surface lots in the Fort Point Channel, which presently serves as a "pressure valve" for financial district parking needs. As development replaces surface lots in this area, the parking needs of both the Fort Point Channel and the financial district will have to be addressed.

- Increasing development of the Fort Point Channel area, which is not now included in the freeze area, could potentially result in provision of parking for more cars than the street system can efficiently handle. Further, there is a danger that the existing residential areas of South Boston on the fringe of the development area would be threatened by an influx of parking lots and traffic.

- The proliferation of surface lots in East Boston (which is also not included in the freeze area) many of which cater to airport users, is and may continue to infringe on residential neighborhoods in the area.

- The economics of parking construction have changed dramatically, due to rising interest rates and construction costs. This change has made many developers reluctant to build more parking than they feel is absolutely necessary for the economic viability of their buildings.

- Recent downtown parking initiatives in Boston have emphasized meeting the needs of residents and short-term parkers through reserving on-street space in neighborhoods for residential use, expanding the overall on-street parking supply and strictly enforcing these spaces to maintain a high turnover.

- Many surface lots are parking far more cars than their official licensed capacities. The City of Boston will be relicensing these at higher capacities, which could remove as many as 690 spaces from the bank.[1]

- New, innovative strategies are being successfully pursued in many cities throughout the country, which make approval of new development contingent on developer and/or employer commitments to transit and ridesharing incentive programs. These programs have proved to be very effective in increasing the use of transit, carpools and vanpools to the site, which alleviates traffic and parking pressures.

4. Recommended Freeze Modifications

With occupancies of downtown public parking facilities presently at 93 percent, a projected parking space deficit of 8114 spaces by 1985, and 22,632 spaces by 1990, meeting the access needs of future development is a serious concern. Simply relaxing the freeze to allow construction of more parking to satisfy the projected deficit is not a desirable option, on traffic congestion, air quality and economic feasibility grounds. Instead, options should be considered which make the freeze into a more flexible tool for managing future downtown access by (a) increasing parking supply in specific locations on the fringes of downtown where growth in automobile trips can be efficiently handled by the street system and encouraging better use of existing parking facilities, (b) ensuring that adequate space is reserved for midday parkers, (c) encouraging increased use of transit, carpools, and vanpools for access to the downtown, and (d) protecting the residential neighborhoods in East Boston, and across the Fort Point Channel in South Boston.

[1]This number was derived by subtracting the licensed capacities of lots in the study area from the number of vehicles observed during recent occupancy checks.

Recommended mechanisms for achieving these objectives are described in the following pages and summarized in Table 1.

MODIFICATION A-1: INCREASE SOUTH STATION SUPPLY

DESCRIPTION: Expand the freeze bank to include an additional 500 spaces at South Station, and an additional 2,500, conditional on a facility designed with a direct link to the highway system. These additional spaces would only be available for allocation to the South Station development site, and not to the rest of the freeze area.

RATIONALE: This modification is aimed at increasing the downtown parking supply to accommodate the access needs of new development, in a manner that will minimize impacts on traffic. South Station is one of the few locations where sufficient roadway capacity exists to handle additional peak period automobile trips. Its fringe location and proximity to the highway system also mean that adding parking will not significantly increase traffic through neighborhoods or on the downtown street network.

Mechanisms for increasing the South Station parking supply by up to 3,000 spaces are presently being studied. These involve incorporating a direct link between the parking facility and the highway system. If and when such a design is committed to, an increase of 3,000 spaces for South Station should be instituted.

IMPACTS: The downtown public parking supply would be increased by between 500 and 3,000 spaces. While the primary use of these spaces would be for commuter (long-term) parking, additional peak traffic could be accommodated without significant deterioration in traffic flow conditions.

Increased parking supply would serve new development in the South Station area, and would accommodate some of the financial district employees now parking in the Fort Point Channel when surface lots there are replaced by new development.

MODIFICATION A-2: INCREASE NORTH STATION SUPPLY

DESCRIPTION: Expand the freeze bank to include an additional 1,500 spaces at North Station. These additional spaces would only be available for allocation to the North Station development site, and not to the rest of the freeze area.

RATIONALE: Aside from South Station, North Station is the only other logical downtown location for significantly expanding the parking supply without adversely impacting traffic conditions. Assuming that minor improvements are made to the Central Artery, an additional 1,500 parking spaces could be added to the North Station area (Zone 3), assuming that the majority of new vehicles would use the Leverett Circle bridge for access to the site.

IMPACTS: Increased public parking availability in the North Station area over and above what would be possible without modifying the freeze.

MODIFICATION B: CONVERSION OF EMPLOYEE SPACES TO PUBLIC SPACES

Description: Allow existing freeze-exempt employee spaces (which have been granted exemptions by December 31, 1983) to be opened up to the public for a fee and expand the freeze bank accordingly.

Rationale: This modification would serve two purposes. First, it would allow spaces in existing reserved employee facilities which are not now used to be made available for public parking. Second, opening employee facilities to the public for a charge would have the added benefit of adequately pricing scarce downtown parking facilities.

Impacts: There are approximately 13,000 reserved employee parking spaces downtown in 134 garages and lots: 42 percent are owned by federal, state and local government organizations, 22 percent by institutional employers (museums, hospitals, churches, charitable organizations, and schools), and 36 percent by other private employers. Average peak occupancy of private facilities is currently 90 percent. If one half of existing reserved employee spaces were opened to the public, an additional 650 spaces (= 10 percent of 6500) would be made available. While many employers feel that reserved employee parking is an important fringe benefit, it is also an expensive one. This freeze modification would provide an incentive for employers to open their facilities to the public, by offering them the opportunity to realize revenues from parking.

A number of studies have shown that employer-provided free parking is an extremely important incentive for commuters to drive alone to work, rather than using transit or ridesharing. One of these studies[1] estimates that approximately 20 percent of those who now drive alone and receive free parking would form carpools or begin using transit to work if required to pay for parking. Applying this figure to the Boston situation (assuming 50 percent of those parking in reserved employee facilities do so for free), overall demand for parking would be reduced by between 440 and 1300 spaces.[2]

[1] Shoup, Donald, and Pickrell, D., "Free Parking as a Transportation Problem," DOT-RSPA-DPB-50/80/16, October, 1980

[2] The low estimate assumes all 20 percent would shift to carpools; the high estimate assumes all would shift to transit.

MODIFICATION C: MIDDAY PARKING BANK

DESCRIPTION: Expand the freeze bank to include a "midday parking bank" starting January 1, 1984. Spaces would be added to this bank as existing private employee facilities are physically eliminated. Spaces from this bank would be allocated for new facilities on the condition that they would not open before 10 a.m. on weekday mornings.

RATIONALE: Meeting the parking needs of shoppers and visitors to the downtown is an important goal of the City. Observed average occupancies of parking facilities at 10 a.m. are nearing the 90 percent mark, which means that many facilities are full by the time shoppers and other visitors arrive downtown. Future commuter parking demand projections indicate that even if the downtown parking supply were expanded considerably, commuters would continue to occupy most of the spaces and there would still be an availability problem for other kinds of parkers. Therefore, efforts should be made to begin reserving a portion of the downtown parking supply for non-commuter use.

IMPACTS: The maximum number of parking spaces which could potentially be "deposited" into the short-term parking bank is 13,400, the total number of reserved employee spaces. However, those in lots (8545) are more likely to be eliminated. The actual number of these employee spaces which will be eliminated over the next 5-10 years is difficult to predict. Assuming that past trends will continue, between 150 and 200 employee spaces per year would be eliminated, which means that 300-400 would be eliminated by the end of 1985, and 1050-1400 would be eliminated by the end of 1990. Therefore, this modification could result in up to 1400 reserved short-term parking spaces downtown by 1990.

MODIFICATION D: ADDITIONAL FREEZE CRITERION - MIDDAY PARKING NEEDS

DESCRIPTION: Add to the existing freeze criteria: "The facility will serve non-commuter parking needs in the area."

RATIONALE: Because of the projected shortage of visitor/shopper parking in Boston, it is important to ensure that newly constructed facilities will accommodate non-commuter parking needs, in addition to serving all-day parkers. Each new parking facility proposal should be evaluated with respect to existing and projected short-term parking needs in the area, and steps should be taken to ensure that a portion of the facility's capacity will be available for parkers arriving in the middle of the day. Such steps might include: opening a portion of the facility after 10 a.m. or establishing a pricing structure in which the all-day rate is more than 4-5 times the 1-hour rate.

IMPACTS: This modification will only impact new facilities which require freeze permits. At present, only 610 spaces are available in the freeze bank. An additional 3000 spaces may be added to the bank from the four city garages which will be sold (Government Center, Kilby St., St. James Ave., and Fort Hill Sq.), as well as potentially 900 spaces which are now in open lots in the North Station development area. All together, 5310 spaces might be available for freeze permits in the next five to ten years (in the existing freeze area). If other recommended modifications are approved, at least 2000 spaces at North and South Stations and 3500 in the Fort Point Channel area would be added as well, for a total of 10,810 spaces. The portion of these new spaces to be reserved for short-term parking would depend on identified needs at particular locations. While demand projections indicate an additional 3700 spaces needed for short-term parkers by 1985, and an additional 7500 needed (over the present) by 1990, it is unlikely that this many spaces would be reserved. Twenty-five percent of the total spaces, or 2700 spaces is a reasonable estimate of the number which might ultimately be reserved as a result of this modification. (This number is net of the number to be reserved as a result of modification C.)

MODIFICIATION E-1: ACCESS PLANS FOR ACCESSORY PARKING APPROVAL

DESCRIPTION: Make freeze permits for new public parking facilities and granting of exemptions for employee spaces which are ancillary to developments over 100,000 gross square feet contingent on BAPCC review and BRA approval of an access plan for the site, which includes an analysis of expected peak and off-peak travel to the site, and commits to traffic mitigation measures.

RATIONALE: In order to accommodate planned and proposed future development, it will be important to encourage increased use of vanpools, carpools and transit by commuters to downtown. One of the most effective ways of doing this is through marketing these alternatives and offering incentives and assistance at the work-site. A number of cities, including San Francisco and Seattle, are incorporating "access planning" into their development review and approval processes, which requires developers to analyze and mitigate the traffic impacts of their new developments. This approach makes sense for Boston, given the amount of development the city would like to attract and the limited capacity of the street system to handle additional traffic.

IMPACTS: This modification, along with E-2, will result in the establishment of transit and ridesharing marketing and incentive programs in new major developments. This in turn, will encourage greater use of transit and provide employees with increased carpooling and vanpooling opportunities. The impacts on traffic and parking demand are difficult to predict, though if 100 additional vanpools were established (there are presently about 100 in use by downtown commuters; as a comparison, Aetna in Hartford has 100 alone), this would reduce future commuter parking demand by 900 spaces.

However, a reasonable yet ambitious parking reduction goal for this strategy, in combination with other ridesharing and transit incentives and driving disincentives discussed in the body of this report is 13,250 spaces. This assumes that 150 commuters who would otherwise drive alone (given present commute conditions) would form vanpools, 150 would form three-person carpools, and 11,000 would ride either the MBTA or newly-formed subscription bus services.

MODIFICATION E-2: ACCESS PLANS FOR MAJOR DEVELOPMENT APPROVAL

DESCRIPTION: Amend Section 6-3A of Boston's Zoning Code to require BAPCC review and BRA approval of access plans for new developments with over 100,000 gross square feet within the Restricted Parking District.

RATIONALE: Same as for E-1.

IMPACTS: This would make approval of all large developments (with or without accessory parking) contingent on an acceptable access plan. Impacts are discussed under E-1.

MODIFICATION F: ADDITIONAL FREEZE CRITERION - FACILITY DESIGNS FOR VANPOOLS VEHICLES

DESCRIPTION: Add the following criterion for freeze approval: "The facility is designed to accommodate vanpool vehicles."

RATIONALE: Vanpooling is a commuting option which has considerable potential for providing future access to the downtown in an efficient manner. Parking facilities should be designed so that clearances and striping of spaces will accommodate vanpool vehicles.

IMPACTS: The modification will prevent construction of new parking facilities which do not allow for vanpool access, thus assuring that vanpoolers will have the same parking opportunities as people commuting in smaller vehicles.

MODIFICATION G-1: FORT POINT CHANNEL/SOUTH BOSTON PARKING MANAGEMENT DISTRICT

DESCRIPTION: Establish a new "parking management district" encompassing the Fort Point Channel area (Zone 12) and South Boston. Freeze the number of total public parking spaces in this area at the existing 3500 spaces (to be increased if roadway capacity improvements presently under consideration are made). Make approval of new facilities in this area subject to existing BAPCC freeze criteria with the following additional one: "The facility will not increase traffic through residential neighborhoods or displace existing residential land uses."

RATIONALE: Over 1.4 million square feet of development is planned or proposed for the Fort Point Channel area. This development will displace open parking lots which presently park over 5000 cars, and will create the demand for an additional 4500 parking spaces. With the present number of parking spaces, the Northern Avenue bridge is already operating at capacity during peak hours. Thus, unless capacity improvements are made, allowing much more than 5000 parking spaces in this area may worsen an already severe congestion problem.

There is also the concern that the high demand for parking in this area could result in developers acquiring now-residential land for parking facility construction, which would adversely affect the South Boston neighborhood.

IMPACTS: This modification would limit parking supply in the Fort Point Channel area to a level which is in line with existing traffic capacity constraints. It would also protect residential neighborhoods from traffic and parking pressures.

MODIFICATION G-2: EAST BOSTON PARKING MANAGEMENT DISTRICT

DESCRIPTION: Establish a new "parking management district" encompassing East Boston. Make approval of new facilities in this area subject to existing BAPCC freeze criteria and the additional one: "The facility will not increase traffic through residential neighborhoods or displace existing residential uses."

RATIONALE: The proliferation of surface lots in East Boston has raised concerns about resultant impacts on the neighborhoods, namely, displacement of residential uses and increased traffic through neighborhoods as a result of new parking facilities.

IMPACTS: Making approval of new parking facilities subject to the "neighborhood protection" freeze criterion above, and the others, including the one stating that no commercial off-street parking should be added to an area which is already adequately served by existing parking facilities should discourage further proliferation of lots in the area.

5. Impacts of the Recommended Modification Package

The recommended package of modifications to the parking freeze and city zoning code provides for a controlled expansion of the downtown commercial parking supply, while emphasizing management of the parking supply in order to improve overall utilization and reservation of spaces for midday (non-commuter) parkers. It also incorporates measures to manage future access to the downtown by involving developers and employers in programs which mitigate potential traffic and parking impacts of developments. Finally, it establishes mechanisms to protect neighborhoods now outside of the freeze area from traffic and parking pressures.

The following table summarizes the quantitative impact assessments of the individual measures:

Modification	Increase in Public Parking Supply	Potential No. of Spaces Reserved For Midday Parkers	Potential Reduction in Commuter Parking Demand
A-1 Increase South Station Supply	500-3000		
A-2 Increase North Station Supply	1500		
B Conversion of Employee Spaces to Public Spaces	650[1]		[440-1300][2]
C Midday Parking Bank	1050-1400[1]	1050-1400	
D Midday Parking Needs Criteria		2700	
E-1 & E-2 Access Plans			13,250
TOTALS	3700-6550	2750-4100	13,250

[1] Would be matched by equivalent decreases in private spaces, and thus would not reduce overall parking deficit.

[2] Included in estimated demand reduction for E-1 and E-2.

The numbers shown above are meant to indicate "order of magnitude" impacts of the modifications package, and must be interpreted in close

association with the assumptions on which they are based. However, they indicate that a substantial proportion of the overall public supply increase would be offset by spaces reserved for midday parkers. Thus, the modifications would enable the city to accommodate many more midday parkers than it could otherwise, while increasing the public parking supply available for commuters only slightly.

The air quality implications of the proposed modifications--particularly of an increase in the public parking supply must be assessed by comparing two future scenarios, with and without modifications.

The number of peak automobile trips bound for downtown Boston in 1990 will depend on the amount of development which occurs between now and then, the total (public and private) parking supply, and "exogenous" factors, such as street capacity and the level of transit service available. It is unlikely that the proposed modifications will significantly affect the amount of development which occurs; this will be determined by economic conditions and larger-scale transportation access changes, such as transit service and street capacity improvements.

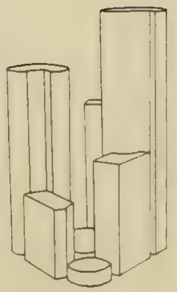
The impact of the modifications on the total parking supply is difficult to predict, as the number of private spaces would still not be limited by the freeze. Assuming that the same ratio of private spaces per 1000 sq. ft. would be built as between 1968 and 1982, with or without the modifications, total supply would be at most eight percent higher than it would be without them. This is conservative, as it is likely that more private spaces would be built without the modification rather than less.

Despite the potential increases in parking supply which may occur with the modifications, the number of commuters parking downtown is likely to be the same as it would be without the modifications. This is due to the fact that without the modifications, commuters would occupy most (if not all) of the downtown parking supply. The modifications ensure that a portion of spaces are reserved for midday parkers.

Thus, peak period automobile travel is not likely to be significantly higher if the modifications are instituted (as compared to a "no action" scenario). All-day vehicle miles of travel are likely to be higher, as more downtown parking spaces would be used by short-term parkers.

In sum, the proposed freeze modifications will not have a major impact on future travel patterns. Rather, they will provide the City with policy tools for accommodating future development in a manner which minimizes negative impacts such as reduction in space available for short-term parkers, spillover parking in neighborhoods and illegal on-street parking, and encourages developers and employers to become more involved in providing opportunities and incentives for more efficient ways of commuting.

Air Quality



AQ APPENDIX B

INTERSECTION ANALYSIS WORKSHEETS

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Atlantic Ave and Surface Artery

Case # 1 Year 1984

		SN	AN	AS	SS
1.	Road segment or intersection approach identification	SN	AN	AS	SS
2.	Observed 1-hr volume (vph)	1010	1176	602	981
	Observed 8-hr volume (vph)	707	929	476	687
	Projected 1-hr peak demand (vph)				
	Projected 8-hr peak demand (vph)				
3.	Percentage cold starts	50/20.6			
4.	Percentage trucks and buses	5.8			
5.	Metropolitan population				
6.	Slope				
7.	Free-flow parameters				
	Number of lanes	2	2	3	3
	Average lane width (ft)	12	12	11	12
	Design speed (mph)	28/35	26/32	22/26	24/29
	Highway type (see Figures 2-5)	Urban Arteries			
8.	Intersection parameters				
	Intersection designation				
	Approach width (ft)				
	Percentage right turns	0	40	0	0
	Percentage left turns	11	45	81	0
	Type control and description of signal controller				
9.	Area source parameters				
	Parking lot gate designation				
	Projected 1-hr peak entrance demand (vph)				
	Projected 1-hr peak exit demand (vph)				
	Projected 8-hr peak entrance demand (vph)				
	Projected 8-hr peak exit demand (vph)				
	Parking lot area (m^2)				
	Parking lot capacity (veh)				
	Running time required to access auxiliary parking (s)				
	Facility emptying time				
	Average cars per stall				
	Average area per stall (m^2)				

SS right turns have no conflicts

SN = Surface Artery N.B. (Xway offramp)

AN = Atlantic Ave N.B. to W B

AS = Atlantic Ave SB to WB

SS = Surface Artery SB

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Atlantic Avenue and Surface Artery

Case # 2 Year 1990

1.	Road segment or intersection approach identification	SN	AN	AS	SS	HE
2.	Observed 1-hr volume (vph)					
	Observed 8-hr volume (vph)					
	Projected 1-hr peak demand (vph)	1507	1480	888	1036	204
	Projected 8-hr peak demand (vph)	1055	1169	702	725	137
3.	Percentage cold starts	50/20.6				
4.	Percentage trucks and buses	5.8				
5.	Metropolitan population					
6.	Slope					
7.	Free-flow parameters					
	Number of lanes	2	2	3	3	2
	Average lane width (ft)	12	12	11	12	12
	Design speed (mph)	28/35	26/32	22/26	24/29	24/30
	Highway type (see Figures 2-5)	Urban Arterials				
8.	Intersection parameters					
	Intersection designation					
	Approach width (ft)	0	0	0	0	100
	Percentage right turns	14	60	100	0	0
	Percentage left turns					
	Type control and description of signal controller					
9.	Area source parameters					
	Parking lot gate designation					
	Projected 1-hr peak entrance demand (vph)					
	Projected 1-hr peak exit demand (vph)					
	Projected 8-hr peak entrance demand (vph)					
	Projected 8-hr peak exit demand (vph)					
	Parking lot area (m^2)					
	Parking lot capacity (veh)					
	Running time required to access auxiliary parking (s)					
	Facility emptying time					
	Average cars per stall					
	Average area per stall (m^2)					

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Atlantic Ave And Surface Artery
Case # 3 Year 1990

1. Road segment or intersection approach identification	SN	AN	AS	SS	HE
2. Observed 1-hr volume (vph)					
Observed 8-hr volume (vph)					
Projected 1-hr peak demand (vph)	1512	1528	888	1104	212
Projected 8-hr peak demand (vph)	1058	1207	702	773	142
3. Percentage cold starts	50/20.6				
4. Percentage trucks and buses	5.8				
5. Metropolitan population					
6. Slope					
7. Free-flow parameters					
Number of lanes	2	2	3	3	2
Average lane width (ft)	12	12	11	12	12
Design speed (mph)	28/35	26/32	22/26	24/29	24/30
Highway type (see Figures 2-5)	Urban Arterial				
8. Intersection parameters					
Intersection designation					
Approach width (ft)					
Percentage right turns	0	0	0	0	100
Percentage left turns	14	58	100	0	0
Type control and description of signal controller					
9. Area source parameters					
Parking lot gate designation					
Projected 1-hr peak entrance demand (vph)					
Projected 1-hr peak exit demand (vph)					
Projected 8-hr peak entrance demand (vph)					
Projected 8-hr peak exit demand (vph)					
Parking lot area (m^2)					
Parking lot capacity (veh)					
Running time required to access auxiliary parking (s)					
Facility emptying time					
Average cars per stall					
Average area per stall (m^2)					

WORKSHEET B - CAPACITY ANALYSIS

Intersection Atlantic Ave And Surface Artery

Case # 1 Year 1990

Step	Symbol	Input/Units	
1	i	Road segment (or approach) designation	SN AN AS SS
2		Free flow capacity computation:	
2.1	M_i	Number of lanes	
2.2	W_p	Adjustment for lane width (Table B-1)	
2.3	T_i	Adjustment for trucks (Table B-2)	
2.4	C_i	Free flow capacity	
3		Signalized intersection capacity:	
3.1	j	Green signal phase identification	A B E D _ C F B
3.2	Wa_i	Approach width with parking (ft)	32 32 20 32 _ 41 32 44
3.3		Percent right turners	0 0 100 0 _ 0 100 0
3.4		Percent left turners	0 11 0 0 _ 81 0 0
3.5		Metropolitan area size	
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)	3500 3200 1750 3500 _ 5800 3200 4800
4		Signalized intersection green phase and cycle length:	
4.1	$V_{i,j}$	Demand Volume for approach and phase	
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio	
4.3	approx G/Cy	Approximate G/Cy	
4.4	$\sum_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase	
4.5	Cy	Signal cycle time (sec)	
4.6	Gj	Green phase length	
4.7	Gj/Cy	Green phase to cycle time ratio	
4.8	$C_{i,j}$	Capacity for approach i phase j	
5		Two-way stop, two-way yield or uncontrolled intersection:	
5.1	V_m+V_n	Major street two-way volume	
5.2	C_i	Cross street capacity	
6		Four-way stop intersections:	
6.1	V_i	Approach volume	
6.2	Spi	Demand split on cross streets	
6.3	C_i	Capacity of approach	
7	C_i	Approach capacity $\sum_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop	

ϕA	S.N. All Movements and A.N Right	12 s.
ϕB	S.N. Left and Straight, SS and A.N. Right	46 s.
ϕC	A.S	18 s.
ϕD	A.N. All Movements	24 s.
	Total	100 s.

Traffic is assumed to move on amber.

$\phi E = \phi A + \phi B = 58s$

$\phi F = 100 s.$

WORKSHEET B - CAPACITY ANALYSIS

Intersection Atlantic Ave and Surface Artery

Case # 2, 3 Year 1990

Step	Symbol	Input/Units	
1	i	Road segment (or approach) designation	SN AN AS SS
2		Free flow capacity computation:	
2.1	M_i	Number of lanes	
2.2	W_f	Adjustment for lane width (Table B-1)	
2.3	T_i	Adjustment for trucks (Table B-2)	
2.4	C_i	Free flow capacity	
3		Signalized intersection capacity:	
3.1	j	Green signal phase identification	A B E D C B
3.2	Wa_i	Approach width with parking (ft)	32 32 20 32 41 44
3.3		Percent right turners	0 0 100 0 0 0
3.4		Percent left turners	0 14 0 0 100 0
3.5		Metropolitan area size	
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)	3500 3200 1750 3500 3800 4800
4		Signalized intersection green phase and cycle length:	
4.1	$V_{i,j}$	Demand Volume for approach and phase	
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio	
4.3	approx G/Cy	Approximate G/Cy	
4.4	$\Sigma_j \max(V_{i,j}Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase	
4.5	Cy	Signal cycle time (sec)	
4.6	Gj	Green phase length	
4.7	Gj/Cy	Green phase to cycle time ratio	
4.8	$C_{i,j}$	Capacity for approach i phase j	
5		Two-way stop, two-way yield or uncontrolled intersection:	
5.1	V_m+V_n	Major street two-way volume	
5.2	C_i	Cross street capacity	
6		Four-way stop intersections:	
6.1	V_i	Approach volume	
6.2	Spi	Demand split on cross streets	
6.3	C_i	Capacity of approach	
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop	

HE

Cross street Capacity

Case 2

3222÷2/2255÷2

248 / 364

Case 3

3303÷2/2312÷

240 / 357

HE Capacity is based on a 4.5 sec critical gap

Signal Timing:

ΦA	11
ΦB	38
ΦC	24
ΦD	27
Total	100

ΦE = ΦA + ΦB = 49

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: ATLANTIC AVE AND SURFACE ARTERY
CASE # 1 YEAR: 1984 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	SN	AN	AS	SS
LINE 2	DEMAND VOLUME (VPH)	1010.	1176.	602	981
LINE 4	CRUISE SPEED (MPH)	28	26	22	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0409	0.0443	0.0519	0.0408
LINE 6.1	NUMBER OF LANES	2	2	3	3
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3500.	1750	3800	3200
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3200	3500	0	4800
LINE 6.4	DEMAND VOLUME (VPH)	209.	471	602.	103
LINE 6.4	DEMAND VOLUME (VPH)	881.	705	0	878
LINE 6.5	SIGNAL CYCLE LENGTH (S)	100.			
LINE 6.6	GREEN PHASE LENGTH (S)	12.	58.	18.	100.
LINE 6.6	GREEN PHASE LENGTH (S)	46.	24.	0.	46.
LINE 6.7	CAPACITY (VPH)	1892.	1855.	684.	5408.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.936	0.575	0.974	0.0
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.720	0.952	0.0	0.661
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	5.433	7.519	16.293	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	16.027	18.637	0.0	16.118
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	1.15	1.73	7.34	0.22
LINE 8.0	LENGTH OF QUEUE (M/LANE)	49.17	60.66	34.27	23.69
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	26.12	29.87	78.59	16.12
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.103	0.109	0.120	0.113
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.034	0.036	0.041	0.039
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.029	0.038	0.026	0.024
LINE 13.	LENGTH OF ACC. AND DEC. (M)	70.1	60.4	43.3	51.5
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	140.2	120.9	86.5	103.0
LINE 15.	IDLING EMISSION RATE (G/S)	1.463	2.047	3.151	0.783
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0251	0.0359	0.0495	0.0199
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0332	0.0484	0.0743	0.0266
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0115	0.0145	0.0087	0.0111

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION ATLANTIC AVE AND SURFACE ARTERY
CASE # 1 YEAR 1984 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	SN	AN	AS	SS
LINE 2	DEMAND VOLUME (VPH)	707	929	476	687
LINE 4	CRUISE SPEED (MPH)	35	32	26	29
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0215	0.0238	0 0300	0 0266
LINE 6 1	NUMBER OF LANES	2	2	3	3
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3500	1750	3800	3200
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3200	3500	0	4800
LINE 6 4	DEMAND VOLUME (VPH)	146	372	476	72
LINE 6 4	DEMAND VOLUME (VPH)	561	557	0	615
LINE 6 5	SIGNAL CYCLE LENGTH (S)	100			
LINE 6 6	GREEN PHASE LENGTH (S)	12	58	18	100
LINE 6 6	GREEN PHASE LENGTH (S)	46	24	0	46
LINE 6 7	CAPACITY (VPH)	1892	1855	684	5408
LINE 6 8	PROPORTION OF VEHICLES THAT STOP	0 918	0 533	0 937	0 0
LINE 6 8	PROPORTION OF VEHICLES THAT STOP	0 655	0 904	0.0	0.619
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	3 724	5 512	12 395	0.0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	10.204	13 984	0 0	10 581
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 60	1 00	2.29	0 15
LINE 8 0	LENGTH OF QUEUE (M/LANE)	31.59	44 59	21 29	15 55
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	23.51	27.02	50.48	15.07
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 095	0 098	0 109	0 101
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 028	0 030	0 036	0 032
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.017	0 025	0 018	0 014
LINE 13	LENGTH OF ACC. AND DEC. (M)	109 5	91 5	60 4	75 2
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	219 0	183 1	120 9	150 4
LINE 15	IDLING EMISSION RATE (G/S)	0 823	1 352	1 521	0 449
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0.0123	0 0199	0 0216	0 0100
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0109	0 0178	0 0207	0.0085
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0042	0 0061	0.0040	0 0051

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: ATLANTIC AVE AND SURFACE ARTERY
CASE # 2 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	SN	AN	AS	SS
LINE 2	DEMAND VOLUME (VPH)	1507	1480	888	1036
LINE 4	CRUISE SPEED (MPH)	28	26	22	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0198	0.0214	0 0251	0.0232
LINE 6 1	NUMBER OF LANES	2	2	3	3
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3500	1750	3800	4800
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3200.	3500	0.	0.
LINE 6 4	DEMAND VOLUME (VPH)	350	593	888	1036
LINE 6 4	DEMAND VOLUME (VPH)	1157	887	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	100			
LINE 6 6	GREEN PHASE LENGTH (S)	11	49	24	38
LINE 6.6	GREEN PHASE LENGTH (S)	38	27	0	0
LINE 6.7	CAPACITY (VPH)	1601.	1803.	912	1824.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 989	0.771	0 992	0.791
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 971	0 978	0.0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	9.614	12 707	24 463	22 753
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	31.211	24.092	0 0	0 0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	16 03	4.59	37 00	1.31
LINE 8.0	LENGTH OF QUEUE (M/LANE)	123 66	90 02	89 12	34 90
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	69.38	38 44	183 74	27.10
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.103	0 109	0 120	0 113
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0 034	0 036	0 041	0.039
LINE 12	EMISSION RATE FOR ACC AND DEC (G/M-S)	0 056	0 053	0 039	0 035
LINE 13.	LENGTH OF ACC. AND DEC. (M)	70.1	60 4	43.3	51 5
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	140.2	120.9	89 1	103.0
LINE 15.	IDLING EMISSION RATE (G/S)	6 782	3 471	11 236	1 630
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0763	0.0554	0 1452	0.0331
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0484	0 0331	0 1013	0 0192
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0 0083	0 0088	0 0062	0 0067

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION ATLANTIC AVE AND SURFACE ARTERY
CASE # 2 YEAR 1990 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	SN	AN	AS	SS
LINE 2	DEMAND VOLUME (VPH)	1055	1169	702	725
LINE 4	CRUISE SPEED (MPH)	35	32	26	29
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0111	0 0122	0 0155	0.0137
LINE 6 1	NUMBER OF LANES	2	2	3	3
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3500	1750	3800	4800
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3200	3500	0	0
LINE 6 4	DEMAND VOLUME (VPH)	245	468	702	725
LINE 6 4	DEMAND VOLUME (VPH)	810	701	0.	0
LINE 6 5	SIGNAL CYCLE LENGTH (S)	100			
LINE 6 6	GREEN PHASE LENGTH (S)	11	41	24	38
LINE 6 6	GREEN PHASE LENGTH (S)	38	27	0	0
LINE 6 7	CAPACITY (VPH)	1601	1803	912	1824
LINE 6 8	PROPORTION OF VEHICLES THAT STOP	0 957	0 696	0 932	0 730
LINE 6 8	PROPORTION OF VEHICLES THAT STOP	0 830	0.913	0 0	0.0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	6.513	9 050	18 178	14 708
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	18 678	17 775	0 0	0 0
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	1 93	1 85	3 34	0 66
LINE 8 0	LENGTH OF QUEUE (M/LANE)	58 99	62 36	31 21	22 28
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	33 99	30 77	48 62	23 94
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 095	0 098	0 109	0 101
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 028	0 030	0.036	0 032
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0 031	0 034	0 026	0 020
LINE 13	LENGTH OF ACC AND DEC. (M)	109 5	91.5	60 4	75 2
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	219 0	183 1	120 9	150 4
LINE 15.	IDLING EMISSION RATE (G/S)	2 009	2.010	2 151	0 928
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0247	0 0281	0 0310	0 0160
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0103	0 0116	0 0136	0 0064
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0033	0 0040	0 0030	0 0028

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: ATLANTIC AVE AND SURFACE ARTERY
CASE # 2 YEAR 1990 AVERAGING TIME 1-HOUR

LINE 1	ROAD SEGMENT ID	HE
LINE 2	DEMAND VOLUME (VPH)	204
LINE 4	CRUISE SPEED (MPH)	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0232
LINE 6.1	NUMBER OF LANES	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0
LINE 6.4	DEMAND VOLUME (VPH)	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0
LINE 6.6	GREEN PHASE LENGTH (S)	0
LINE 6.7	CAPACITY (VPH)	248
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	4.64
LINE 8.0	LENGTH OF QUEUE (M/LANE)	10.08
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	67.30
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.113
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.039
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.009
LINE 13	LENGTH OF ACC. AND DEC. (M)	51.5
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	103.0
LINE 15	IDLING EMISSION RATE (G/S)	0.900
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0.0130
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0083
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0013

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION ATLANTIC AVE AND SURFACE ARTERY
CASE # 2 YEAR 1990 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	HE
LINE 2	DEMAND VOLUME (VPH)	137
LINE 4	CRUISE SPEED (MPH)	30
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0132
LINE 6 1	NUMBER OF LANES	2
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0
LINE 6 4	DEMAND VOLUME (VPH)	0
LINE 6 5	SIGNAL CYCLE LENGTH (S)	0
LINE 6 6	GREEN PHASE LENGTH (S)	0
LINE 6 7	CAPACITY (VPH)	364
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 60
LINE 8.0	LENGTH OF QUEUE (M/LANE)	1.31
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	5 97
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 100
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 031
LINE 12	EMISSION RATE FOR ACC AND DEC (G/M-S)	0 005
LINE 13	LENGTH OF ACC AND DEC (M)	80 5
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	160 9
LINE 15	IDLING EMISSION RATE (G/S)	-0 000
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0025
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0008
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0005

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: ATLANTIC AVE AND SURFACE ARTERY
CASE # 3 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	SN	AN	AS	SS
LINE 2	DEMAND VOLUME (VPH)	1512	1528	888	1104
LINE 4	CRUISE SPEED (MPH)	28	26	22	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0198	0.0214	0 0251	0 0232
LINE 6 1	NUMBER OF LANES	2	2	3	3
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3500.	1750	3800	4800
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3200	3500	0	0
LINE 6 4	DEMAND VOLUME (VPH)	350	641	888	1104
LINE 6 4	DEMAND VOLUME (VPH)	1162.	887	0.	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	100			
LINE 6 6	GREEN PHASE LENGTH (S)	11	49	24	38
LINE 6.6	GREEN PHASE LENGTH (S)	38.	27	0	0
LINE 6 7	CAPACITY (VPH)	1601.	1803	912.	1824
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.989	0.805	0.992	0.805
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.974	0.978	0.0	0 0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	9.614	14 330	24.463	24 693
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	31 423	24 092	0.0	0 0
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	16 99	5.57	37 00	1 53
LINE 8.0	LENGTH OF QUEUE (M/LANE)	126.21	95 67	89 12	38.03
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	71.58	40 44	183.74	27 99
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.103	0 109	0.120	0.113
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 034	0 036	0 041	0.039
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.056	0 056	0.039	0.038
LINE 13	LENGTH OF ACC. AND DEC. (M)	70 1	60 4	43.3	51.5
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	140 2	120.9	89 1	103.0
LINE 15	IDLING EMISSION RATE (G/S)	7 039	3 800	11.236	1 806
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0783	0 0593	0 1452	0 0363
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0498	0 0357	0 1013	0 0211
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0083	0.0091	0 0062	0 0071

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET & CONGRESS STREET
CASE # 3 YEAR: 1990 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	CE
LINE 2	DEMAND VOLUME (VPH)	1543	1045.
LINE 4	CRUISE SPEED (MPH)	30	25
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0132	0.0161
LINE 6.1	NUMBER OF LANES	4	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	5100	5700
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	7100	0
LINE 6.4	DEMAND VOLUME (VPH)	329	1045.
LINE 6.4	DEMAND VOLUME (VPH)	1214	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90.	
LINE 6.6	GREEN PHASE LENGTH (S)	16.	35
LINE 6.6	GREEN PHASE LENGTH (S)	39	0.
LINE 6.7	CAPACITY (VPH)	3983	2217
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.879	0.748
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.684	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	7.229	19.549
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	20.745	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.63	0.89
LINE 8.0	LENGTH OF QUEUE (M/LANE)	31.11	22.23
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	21.22	22.03
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.100	0.111
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.031	0.038
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.041	0.032
LINE 13	LENGTH OF ACC. AND DEC. (M)	80.5	55.9
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	160.9	111.7
LINE 15	IDLING EMISSION RATE (G/S)	1.657	1.255
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0307	0.0274
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0121	0.0110
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0057	0.0047

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase And Congress Streets

Case # 1 Year 1984 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	CE		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	16	-74		
4	x	Lateral Distance (m)	11	13		
5	Yu	Maximum Longitudinal Distance (m)	92	NA*		
6	Yd	Minimum Longitudinal Distance (m)	20	NA*		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0675	.0568		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0202	.0193		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	440	NA		
	Qf	Enter Line 9	x .0202	x .0193	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	8.9	0.0		
13	χUQ^{-1}	Normalized Concentration (For Yu)	375	NA		
	Qe	Enter Line 8	.0675	.0568		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	25.3	0.0		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	NA		
	Qe	Enter Line 8	x .0675	x .0568	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	34.2	0.0		
20	χ	CO Concentration (ppm)-- Total	29.8	0.0		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{29.8\ ppm}$

* Down wind of Receptor

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: ATLANTIC AVE AND SURFACE ARTERY
CASE # 3 YEAR 1990 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	HE
LINE 2	DEMAND VOLUME (VPH)	142
LINE 4	CRUISE SPEED (MPH)	30
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0132
LINE 6 1	NUMBER OF LANES	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0.
LINE 6.4	DEMAND VOLUME (VPH)	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0.
LINE 6.6	GREEN PHASE LENGTH (S)	0.
LINE 6.7	CAPACITY (VPH)	357
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 66
LINE 8.0	LENGTH OF QUEUE (M/LANE)	1.44
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	6 66
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.100
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.031
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.005
LINE 13.	LENGTH OF ACC. AND DEC (M)	80 5
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	160.9
LINE 15.	IDLING EMISSION RATE (G/S)	0 007
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0026
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0009
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0.0005

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Atlantic Ave and Surface Artery

Case # 1 Year 1984 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	SN	AN	AS	SS
			Traffic Stream			
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	40	30	85	40
4	x	Lateral Distance (m)	40	16	51	43
5	Yu	Maximum Longitudinal Distance (m)	57	63	20	171
6	Yd	Minimum Longitudinal Distance (m)	0	0	0	68
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0332	.0484	.0743	.0266
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0115	.0145	.0087	.0111
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	170	260	115	165
	Qf	Enter Line 9	x .0115	x .0145	x .0087	x .0111
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.0	3.8	1.0	1.8
13	χUQ^{-1}	Normalized Concentration (For Yu)	40	230	50	160
	Qe	Enter Line 8	.0332	.0484	.0743	.0266
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	1.3	11.1	3.7	4.3
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	80
	Qe	Enter Line 8	x .0332	x .0484	x .0743	x .0266
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷ 2.1
19	χ	CO ($mg\ m^{-3}$) Total	3.3	14.9	4.7	4.0
20	χ	CO Concentration (ppm)-- Total	2.9	13.0	4.1	3.5
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{23.5\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Atlantic Ave and Surface Artery

Case # 1 Year 1984 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream SN	AN	AS	SS
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	40	30	85	40
4	x	Lateral Distance (m)	40	16	51	43
5	Yu	Maximum Longitudinal Distance (m)	57	63	20	218
6	Yd	Minimum Longitudinal Distance (m)	0	0	0	68
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0109	.0178	.0207	.0085
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0042	.0061	.0040	.0051
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	170	260	115	165
	Qf	Enter Line 9	x .0042	x .0061	x .0040	x .0051
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	0.4	1.0	0.3	0.5
13	χUQ^{-1}	Normalized Concentration (For Yu)	40	230	50	160
	Qe	Enter Line 8	.0109	.0178	.0207	.0085
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration-"Maximum Queue"	0.3	2.6	0.6	0.9
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	80
	Qe	Enter Line 8	x .0109	x .0178	x .0207	x .0085
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration-"Imaginery Queue"	+ 0	+ 0	+ 0	+ 0.4
19	χ	CO ($mg\ m^{-3}$) Total	0.7	3.6	0.9	1.0
20	χ	CO Concentration (ppm)-- Total	0.6	3.1	0.8	0.9
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{5.4 \text{ppm}}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Atlantic Ave and Surface Artery
Case # 2 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	SN	AN	AS	SS	HE
1	SC	Stability Class	D				
2	U	Wind Speed ($m\ s^{-1}$)	1.0				
3	θ	Wind-Road Angle (deg)	40	30	85	40	50
4	x	Lateral Distance (m)	40	16	51	43	33
5	Yu	Maximum Longitudinal Distance (m)	57	63	20	171	190
6	Yd	Minimum Longitudinal Distance (m)	0	0	0	68	87
7	σ_{zo}	Initial Dispersion (m)	5.0				
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0484	.0331	.1013	.0192	.0083
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0083	.0088	.0062	.0067	.0013
9a		Street Canyon? Yes or No	NO				
		DISPERSION ANALYSIS					
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	170	260	115	165	150
	Qf	Enter Line 9	x	x	x	x	
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)					
	U	Enter Line 2	÷ 1.0	÷	÷	÷	
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	1.4	2.2	0.7	1.1	0.2
13	χUQ^{-1}	Normalized Concentration (For Yu)	40	230	50	160	170
	Qe	Enter Line 8					
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)					
	U	Enter Line 2	1.0				
15	χ	CO Concentration--"Maximum Queue"	1.9	7.6	5.1	3.1	1.4
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	80	170
	Qe	Enter Line 8	x	x	x	x	
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)					
	U	Enter Line 2	1.0				
18	χ	CO Concentration--"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷ 1.5	1.4
19	χ	CO ($mg\ m^{-3}$) Total	3.3	9.8	5.8	2.7	0.2
20	χ	CO Concentration (ppm)-- Total	2.9	8.5	5.0	2.3	0.2
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)					
21	z	Height of Receptor (m)					
22		z-Correction Factor					
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)					
24	χ'	CO Concentration at Height z (ppm)					

$\boxed{18.9\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Atlantic Ave and Surface Artery

Case # 2 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	SN	AN	AS	SS	HE
1	SC	Stability Class	D				
2	U	Wind Speed ($m\ s^{-1}$)	1.6				
3	θ	Wind-Road Angle (deg)	40	30	85	40	50
4	x	Lateral Distance (m)	40	16	51	43	33
5	Yu	Maximum Longitudinal Distance (m)	57	63	20	218	247
6	Yd	Minimum Longitudinal Distance (m)	0	0	0	68	87
7	σ_{zo}	Initial Dispersion (m)	5.0				
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0103	.0116	.0136	.0064	.0008
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0033	.0040	.0030	.0028	.0005
9a		Street Canyon? Yes or No	NO				
		DISPERSION ANALYSIS					
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	170	260	115	165	150
	Qf	Enter Line 9	x	x	x	x	
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)					
	U	Enter Line 2	÷ 1.6	÷	÷	÷	
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	0.4	0.7	0.2	0.3	0.0
13	χUQ^{-1}	Normalized Concentration (For Yu)	40	230	50	160	170
	Qe	Enter Line 8					
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)					
	U	Enter Line 2	1.6				
15	χ	CO Concentration-"Maximum Queue"	0.3	1.7	0.4	0.6	0.1
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	80	170
	Qe	Enter Line 8	x	x	x	x	
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)					
	U	Enter Line 2	1.6				
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷ 0.3	0.1
19	χ	CO ($mg\ m^{-3}$) Total	0.7	2.4	0.6	0.6	0.0
20	χ	CO Concentration (ppm)-- Total	0.6	2.1	0.5	0.5	0.0
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)					3.7 ppm
21	z	Height of Receptor (m)					
22		z-Correction Factor					
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)					
24	χ'	CO Concentration at Height z (ppm)					

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Atlantic Ave and Surface Artery

Case # 3 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream SN	AN	AS	SS	HE
1	SC	Stability Class	D				
2	U	Wind Speed (m s^{-1})	1.0				
3	θ	Wind-Road Angle (deg)	40	30	85	40	50
4	x	Lateral Distance (m)	40	16	51	43	33
5	Yu	Maximum Longitudinal Distance (m)	57	63	20	171	190
6	Yd	Minimum Longitudinal Distance (m)	0	0	0	68	87
7	σ_{zo}	Initial Dispersion (m)	5.0				
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0498	.0357	.1013	.0211	.0136
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0083	.0091	.0062	.0071	.0014
9a		Street Canyon? Yes or No	NO				
		DISPERSION ANALYSIS					
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	170	260	115	165	150
	Qf	Enter Line 9	x	x	x	x	
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)					
	U	Enter Line 2	÷ 1.0	÷	÷	÷	
12	χ	CO Concentration (mg m^{-3}) Through Emissions	1.4	2.4	0.7	1.2	0.2
13	χUQ^{-1}	Normalized Concentration (For Yu)	40	230	50	160	170
	Qe	Enter Line 8					
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)					
	U	Enter Line 2	1.0				
15	χ	CO Concentration-"Maximum Queue"	2.0	8.2	5.1	3.3	2.3
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	80	170
	Qe	Enter Line 8	x	x	x	x	
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)					
	U	Enter Line 2	1.0				
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷ 1.7	2.3
19	χ	CO (mg m^{-3}) Total	3.4	10.6	5.8	2.8	0.2
20	χ	CO Concentration (ppm)-- Total	3.0	9.2	5.0	2.4	0.2
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)					$\boxed{19.8ppm}$
21	z	Height of Receptor (m)					
22		z-Correction Factor					
23	χ'	CO Concentration at Height z (mg m^{-3})					
24	χ'	CO Concentration at Height z (ppm)					

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Atlantic Ave and Surface Artery

Case # 3 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	SN	AN	AS	SS	HE
1	SC	Stability Class	D				
2	U	Wind Speed (m s^{-1})	1.6				
3	θ	Wind-Road Angle (deg)	40	30	85	40	50
4	x	Lateral Distance (m)	40	16	51	43	33
5	Yu	Maximum Longitudinal Distance (m)	57	63	20	218	247
6	Yd	Minimum Longitudinal Distance (m)	0	0	0	65	87
7	σ_{zo}	Initial Dispersion (m)	5.0				
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0103	.0121	.0136	.0070	.0009
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0033	.0041	.0030	.0029	.0005
9a		Street Canyon? Yes or No	NO				
		DISPERSION ANALYSIS					
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	170	260	115	165	150
	Qf	Enter Line 9	x	x	x	x	
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)					
	U	Enter Line 2	÷ 1.6	÷	÷	÷	
12	χ	CO Concentration (mg m^{-3}) Through Emissions	0.4	0.7	0.2	0.3	0.0
13	χUQ^{-1}	Normalized Concentration (For Yu)	40	230	50	160	170
	Qe	Enter Line 8					
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)					
	U	Enter Line 2	1.6				
15	χ	CO Concentration-"Maximum Queue"	0.3	1.7	0.4	0.7	0.1
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	80	170
	Qe	Enter Line 8	x	x	x	x	
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)					
	U	Enter Line 2	1.6				
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷ 0.3	0.1
19	χ	CO (mg m^{-3}) Total	0.7	2.4	0.6	0.7	0.0
20	χ	CO Concentration (ppm)-- Total	0.6	2.1	0.5	0.6	0.0
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)					$\boxed{3.8 ppm}$
21	z	Height of Receptor (m)					
22		z-Correction Factor					
23	χ'	CO Concentration at Height z (mg m^{-3})					
24	χ'	CO Concentration at Height z (ppm)					

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Purchase And Congress Streets

Case # 1 Year 1984

1.	Road segment or intersection approach identification	PS	CE
2.	Observed 1-hr volume (vph)	1293	1232
	Observed 8-hr volume (vph)	905	838
	Projected 1-hr peak demand (vph)		
	Projected 8-hr peak demand (vph)		
3.	Percentage cold starts (1Hr/8Hr)	50.0/20.6	
4.	Percentage trucks and buses	3.0	
5.	Metropolitan population		
6.	Slope		
7.	Free-flow parameters		
	Number of lanes	4	4
	Average lane width (ft)	15	13
	Design speed (mph) (1Hr/8Hr)	20/30	20/25
	Highway type (see Figures 2-5)	Urban Artery	
8.	Intersection parameters		
	Intersection designation		
	Approach width (ft)	60	52
	Percentage right turns	0	12
	Percentage left turns	51	0
	Type control and description of signal controller	Signalized	
9.	Area source parameters		
	Parking lot gate designation		
	Projected 1-hr peak entrance demand (vph)		
	Projected 1-hr peak exit demand (vph)		
	Projected 8-hr peak entrance demand (vph)		
	Projected 8-hr peak exit demand (vph)		
	Parking lot area (m^2)		
	Parking lot capacity (veh)		
	Running time required to access auxiliary parking (s)		
	Facility emptying time		
	Average cars per stall		
	Average area per stall (m^2)		

PS = Purchase Street S.B

CE = Congress Street E.B.

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Purchase And Congress Streets

Case # 2 Year 1990

1.	Road segment or intersection approach identification	PS __ __ CE __ __ __
2.	Observed 1-hr volume (vph)	__ __ __ __ __ __ __
	Observed 8-hr volume (vph)	__ __ __ __ __ __ __
	Projected 1-hr peak demand (vph)	2071 __ 1459 __ __
	Projected 8-hr peak demand (vph)	1450 __ 992 __ __
3.	Percentage cold starts (1Hr/8Hr)	50.0/20.6 __ __
4.	Percentage trucks and buses	3.0 __ __ __ __ __
5.	Metropolitan population	__ __ __ __ __ __ __
6.	Slope	__ __ __ __ __ __ __
7.	Free-flow parameters	
	Number of lanes	4 __ __ 4 __ __ __
	Average lane width (ft)	15 __ __ 13 __ __ __
	Design speed (mph) (1Hr/8Hr)	20/30 __ 20/25 __ __
	Highway type (see Figures 2-5)	Urban Artery
8.	Intersection parameters	
	Intersection designation	__ __ __ __ __ __ __
	Approach width (ft)	60 __ __ 52 __ __ __
	Percentage right turns	0 __ __ 22 __ __ __
	Percentage left turns	41 __ __ 0 __ __ __
	Type control and description of signal controller	Signalized
9.	Area source parameters	
	Parking lot gate designation	__ __ __ __ __ __ __
	Projected 1-hr peak entrance demand (vph)	__ __ __ __ __ __ __
	Projected 1-hr peak exit demand (vph)	__ __ __ __ __ __ __
	Projected 8-hr peak entrance demand (vph)	__ __ __ __ __ __ __
	Projected 8-hr peak exit demand (vph)	__ __ __ __ __ __ __
	Parking lot area (m^2)	__
	Parking lot capacity (veh)	__
	Running time required to access auxiliary parking (s)	__
	Facility emptying time	__
	Average cars per stall	__
	Average area per stall (m^2)	__

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Purchase And Congress Streets
Case # 3 Year 1990

1. Road segment or intersection approach identification	PS			CE			
2. Observed 1-hr volume (vph)							
Observed 8-hr volume (vph)							
Projected 1-hr peak demand (vph)	2204			1537			
Projected 8-hr peak demand (vph)	1543			1045			
3. Percentage cold starts (1Hr/8Hr)	50.0/20.6						
4. Percentage trucks and buses	3.0						
5. Metropolitan population							
6. Slope							
7. Free-flow parameters							
Number of lanes	4			4			
Average lane width (ft)	15			13			
Design speed (mph)	20/30			20/25			
Highway type (see Figures 2-5)	Urban Artery						
8. Intersection parameters							
Intersection designation							
Approach width (ft)	60			52			
Percentage right turns	0			21			
Percentage left turns	40			0			
Type control and description of signal controller							
9. Area source parameters							
Parking lot gate designation							
Projected 1-hr peak entrance demand (vph)							
Projected 1-hr peak exit demand (vph)							
Projected 8-hr peak entrance demand (vph)							
Projected 8-hr peak exit demand (vph)							
Parking lot area (m^2)							
Parking lot capacity (veh)							
Running time required to access auxiliary parking (s)							
Facility emptying time							
Average cars per stall							
Average area per stall (m^2)							

WORKSHEET B - CAPACITY ANALYSIS

Intersection Purchase And Congress Streets

Case # 1 Year 1984

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	PS		CE	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes				
2.2	W_F	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification	ØA/ØB		ØC	
3.2	Wa_i	Approach width with parking (ft)	45/68		52	
3.3		Percent right turners	0		12	
3.4		Percent left turners	0		0	
3.5		Metropolitan area size	2.5M			
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)	5100/7800*		5700	
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume				
5.2	C_i	Cross street capacity				
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

* 8hr capacity assumes parking 50% of the time along one side of Purchase Street (observed - not legal). Capacity lowers to 7800.

WORKSHEET B - CAPACITY ANALYSIS

Intersection Purchase And Congress Streets

Case # 2 Year 1990

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	PS		CE	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes				
2.2	W_f	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification	ØA/ØB		ØC	
3.2	Wa_i	Approach width with parking (ft)	45/68		52	
3.3		Percent right turners	0		22	
3.4		Percent left turners	0		0	
3.5		Metropolitan area size	2.5M			
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)	5100/7800*		5700	
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\sum_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume				
5.2	C_i	Cross street capacity				
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\sum_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

WORKSHEET B - CAPACITY ANALYSIS

Intersection Purchase And Congress Streets

Case # 3 Year 1990

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	PS		CE	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes				
2.2	W_r	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification	ØA/ØB		ØC	
3.2	Wa_i	Approach width with parking (ft)	45/68		52	
3.3		Percent right turners	0		21	
3.4		Percent left turners	0		0	
3.5		Metropolitan area size	2.5M			
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)	5100/7500*		5700	
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\sum_j \max(V_{i,j}Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume				
5.2	C_i	Cross street capacity				
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\sum_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET & CONGRESS STREET
CASE # 1 YEAR: 1984 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	CE
LINE 2	DEMAND VOLUME (VPH)	1293.	1232.
LINE 4	CRUISE SPEED (MPH)	20	20
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0563	0.0563
LINE 6.1	NUMBER OF LANES	4	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	5100.	5700.
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	7800.	0.
LINE 6.4	DEMAND VOLUME (VPH)	470.	1232.
LINE 6.4	DEMAND VOLUME (VPH)	823.	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90.	
LINE 6.6	GREEN PHASE LENGTH (S)	16.	38.
LINE 6.6	GREEN PHASE LENGTH (S)	36.	0.
LINE 6.7	CAPACITY (VPH)	4027.	2407.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.906	0.737
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.671	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	10.642	22.702
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	13.801	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.47	1.05
LINE 8.0	LENGTH OF QUEUE (M/LANE)	27.10	25.83
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	24.13	20.73
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.130	0.130
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.046	0.046
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.048	0.044
LINE 13.	LENGTH OF ACC. AND DEC. (M)	35.8	35.8
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	71.5	71.5
LINE 15	IDLING EMISSION RATE (G/S)	1.837	1.455
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0496	0.0425
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0675	0.0568
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0.0202	0.0193

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET & CONGRESS STREET
CASE # 1 YEAR: 1984 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	CE
LINE 2	DEMAND VOLUME (VPH)	905	838.
LINE 4	CRUISE SPEED (MPH)	30	25
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0256	0.0312
LINE 6.1	NUMBER OF LANES	4	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	5100	5700
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	7100.	0.
LINE 6.4	DEMAND VOLUME (VPH)	329.	838.
LINE 6.4	DEMAND VOLUME (VPH)	576	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90.	
LINE 6.6	GREEN PHASE LENGTH (S)	16.	38
LINE 6.6	GREEN PHASE LENGTH (S)	36.	0.
LINE 6.7	CAPACITY (VPH)	3747.	2407.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.879	0.677
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.653	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	7.229	14.191
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	9.403	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.32	0.53
LINE 8.0	LENGTH OF QUEUE (M/LANE)	18.43	16.01
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	23.35	18.41
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.100	0.111
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.031	0.038
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.024	0.023
LINE 13	LENGTH OF ACC. AND DEC. (M)	80.5	55.9
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	160.9	111.7
LINE 15.	IDLING EMISSION RATE (G/S)	1.108	0.793
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0190	0.0188
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0167	0.0164
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0064	0.0073

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET & CONGRESS STREET
CASE # 2 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	CE
LINE 2	DEMAND VOLUME (VPH)	2071.	1459.
LINE 4	CRUISE SPEED (MPH)	20	20
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0271	0.0271
LINE 6.1	NUMBER OF LANES	4	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	5100	5700.
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	7800	0.
LINE 6.4	DEMAND VOLUME (VPH)	470	1459.
LINE 6.4	DEMAND VOLUME (VPH)	1601.	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90.	
LINE 6.6	GREEN PHASE LENGTH (S)	16	35.
LINE 6.6	GREEN PHASE LENGTH (S)	39.	0.
LINE 6.7	CAPACITY (VPH)	4287.	2217.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.906	0.821
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.713	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	10.642	29.959
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	28 539	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.93	1.93
LINE 8.0	LENGTH OF QUEUE (M/LANE)	43.63	34.67
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	22.45	25.71
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 130	0.130
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.046	0.046
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.077	0.059
LINE 13.	LENGTH OF ACC AND DEC (M)	35.8	35.8
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	71.5	71.5
LINE 15.	IDLING EMISSION RATE (G/S)	2.695	2.235
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0760	0 0605
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0444	0.0358
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0.0156	0.0110

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET & CONGRESS STREET
CASE # 2 YEAR: 1990 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	CE
LINE 2	DEMAND VOLUME (VPH)	1450	992.
LINE 4	CRUISE SPEED (MPH)	30	25
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0132	0.0161
LINE 6 1	NUMBER OF LANES	4	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	5100	5700
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	7100	0
LINE 6.4	DEMAND VOLUME (VPH)	329	992.
LINE 6 4	DEMAND VOLUME (VPH)	1121	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90	
LINE 6.6	GREEN PHASE LENGTH (S)	16.	35
LINE 6.6	GREEN PHASE LENGTH (S)	39	0
LINE 6.7	CAPACITY (VPH)	3983.	2217
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.879	0.740
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.673	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	7.229	18.349
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	18.858	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 57	0.81
LINE 8.0	LENGTH OF QUEUE (M/LANE)	28.99	20.84
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	21.16	21.66
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.100	0.111
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.031	0.038
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.038	0 030
LINE 13	LENGTH OF ACC. AND DEC. (M)	80 5	55 9
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	160 9	111.7
LINE 15.	IDLING EMISSION RATE (G/S)	1.551	1 166
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0286	0.0256
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0113	0.0103
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0053	0.0044

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET & CONGRESS STREET
CASE # 3 YEAR 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	CE
LINE 2	DEMAND VOLUME (VPH)	2204.	1537.
LINE 4	CRUISE SPEED (MPH)	20	20
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0271	0.0271
LINE 6.1	NUMBER OF LANES	4	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	5100.	5700
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	7800	0.
LINE 6.4	DEMAND VOLUME (VPH)	470	1537.
LINE 6.4	DEMAND VOLUME (VPH)	1734.	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90.	
LINE 6.6	GREEN PHASE LENGTH (S)	16	35.
LINE 6.6	GREEN PHASE LENGTH (S)	39	0.
LINE 6.7	CAPACITY (VPH)	4287.	2217.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.906	0.837
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.729	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	10.642	32 152
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	31.587	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	1.86	2.26
LINE 8.0	LENGTH OF QUEUE (M/LANE)	47.07	37.42
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	22.65	26.68
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.130	0.130
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.046	0.046
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.083	0.063
LINE 13.	LENGTH OF ACC. AND DEC (M)	35.8	35.8
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	71 5	71.5
LINE 15	IDLING EMISSION RATE (G/S)	2.901	2.460
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0818	0.0658
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0479	0.0390
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0166	0.0116

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION ATLANTIC AVE AND SURFACE ARTERY
CASE # 3 YEAR 1990 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	SN	AN	AS	SS
LINE 2	DEMAND VOLUME (VPH)	1058	1207.	702	773
LINE 4	CRUISE SPEED (MPH)	35	32	26	29
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0111	0.0122	0 0155	0 0137
LINE 6.1	NUMBER OF LANES	2	2	3	3
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3500	1750	3800	4800
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	3200.	3500	0	0
LINE 6 4	DEMAND VOLUME (VPH)	245	506	702	773
LINE 6 4	DEMAND VOLUME (VPH)	813	701	0	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	100			
LINE 6 6	GREEN PHASE LENGTH (S)	11	49	24	38
LINE 6.6	GREEN PHASE LENGTH (S)	38.	27	0	0
LINE 6.7	CAPACITY (VPH)	1601.	1803	912	1824
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 957	0 717	0 932	0 739
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.831	0.913	0 0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	6 513	10 084	18 178	15.868
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	18 771	17 775	0 0	0 0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	1 95	2 03	3 34	0 74
LINE 8.0	LENGTH OF QUEUE (M/LANE)	59 23	65 00	31 21	24 08
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	34.04	31.07	48 62	24.36
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 095	0 098	0 109	0 101
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.028	0 030	0.036	0 032
LINE 12.	EMISSION RATE FOR ACC AND DEC (G/M-S)	0 031	0 036	0 026	0 021
LINE 13.	LENGTH OF ACC AND DEC. (M)	109.5	91.5	60.4	75 2
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	219.0	183 1	120 9	150 4
LINE 15.	IDLING EMISSION RATE (G/S)	2 019	2 101	2 151	1 012
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0 0248	0 0293	0 0310	0.0173
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0103	0 0121	0.0136	0 0070
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0 0033	0 0041	0 0030	0 0029

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: ATLANTIC AVE AND SURFACE ARTERY
CASE # 3 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	HE
LINE 2	DEMAND VOLUME (VPH)	212
LINE 4	CRUISE SPEED (MPH)	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0232
LINE 6.1	NUMBER OF LANES	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0
LINE 6.4	DEMAND VOLUME (VPH)	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0
LINE 6.6	GREEN PHASE LENGTH (S)	0
LINE 6.7	CAPACITY (VPH)	240.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	7.57
LINE 8.0	LENGTH OF QUEUE (M/LANE)	16.47
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	113.57
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.113
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.039
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.009
LINE 13.	LENGTH OF ACC. AND DEC. (M)	51.5
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	103.0
LINE 15.	IDLING EMISSION RATE (G/S)	1.627
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0203
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0136
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0.0014

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase And Congress Streets

Case # \ Year 1984 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	CE		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	10	-80		
4	x	Lateral Distance (m)	11	13		
5	Yu	Maximum Longitudinal Distance (m)	181	NA		
6	Yd	Minimum Longitudinal Distance (m)	20	NA		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0167	.0164		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0064	.0073		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	625	NA		
	Qf	Enter Line 9	x .0064	x .0073	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.5	0.0		
13	χUQ^{-1}	Normalized Concentration (For Yu)	500	NA		
	Qe	Enter Line 8	.0167	.0164		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration-"Maximum Queue"	5.2	0.0		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	NA		
	Qe	Enter Line 8	x .0167	x .0164	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	7.7	0.0		
20	χ	CO Concentration (ppm)-- Total	6.7	0.0		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{6.7\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase And Congress Streets

Case # 2 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	CE		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	16	-74		
4	x	Lateral Distance (m)	11	13		
5	Yu	Maximum Longitudinal Distance (m)	92	NA		
6	Yd	Minimum Longitudinal Distance (m)	20	NA		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0444	.0358		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0156	.0110		
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	440	NA		
	Qf	Enter Line 9	x .0156	x .0110	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	6.9	0.0		
13	χUQ^{-1}	Normalized Concentration (For Yu)	375	NA		
	Qe	Enter Line 8	.0444	.0358		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	16.7	0.0		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	NA		
	Qe	Enter Line 8	x .0444	x .0358	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	23.6	0.0		
20	χ	CO Concentration (ppm)-- Total	20.5	0.0		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{20.5\ pp}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase And Congress Streets

Case # 2 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	CE		
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.6			
3	θ	Wind-Road Angle (deg)	10	-80		
4	x	Lateral Distance (m)	11	13		
5	Yu	Maximum Longitudinal Distance (m)	181	NA		
6	Yd	Minimum Longitudinal Distance (m)	20	NA		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0113	.0103		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0053	.0044		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	625	NA		
	Qf	Enter Line 9	x .0053	x .0044	x	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	2.1	0.0		
13	χUQ^{-1}	Normalized Concentration (For Yu)	500	NA		
	Qe	Enter Line 8	.0113	.0103		
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration-"Maximum Queue"	3.5	0.0		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	NA		
	Qe	Enter Line 8	x .0113	x .0103	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO (mg m^{-3}) Total	5.6	0.0		
20	χ	CO Concentration (ppm)-- Total	4.9	0.0		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{4.9 \text{ ppm}}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase And Congress Streets

Case # 3 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	CE		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	16	-74		
4	x	Lateral Distance (m)	11	13		
5	Yu	Maximum Longitudinal Distance (m)	92	NA		
6	Yd	Minimum Longitudinal Distance (m)	20	NA		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0479	.0390		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0166	.0116		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	XUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	440	NA		
	Qf	Enter Line 9	x .0166	x .0116	x	x
11	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	X	CO Concentration ($mg\ m^{-3}$) Through Emissions	7.3	0.0		
13	XUQ^{-1}	Normalized Concentration (For Yu)	375	NA		
	Qe	Enter Line 8	.0479	.0390		
14	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	X	CO Concentration--"Maximum Queue"	18.0	0.0		
16	XUQ^{-1}	Normalized Concentration (For Yd)	0	NA		
	Qe	Enter Line 8	x .0479	x .0390	x	x
17	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	X	CO Concentration--"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	X	CO ($mg\ m^{-3}$) Total	25.3	0.0		
20	X	CO Concentration (ppm)-- Total	22.0	0.0		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	X´	CO Concentration at Height z ($mg\ m^{-3}$)				
24	X´	CO Concentration at Height z (ppm)				

$\boxed{22.0\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase And Congress Streets

Case # 3 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	CE		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	10	-80		
4	x	Lateral Distance (m)	11	13		
5	Yu	Maximum Longitudinal Distance (m)	181	NA		
6	Yd	Minimum Longitudinal Distance (m)	20	NA		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0121	.0110		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0057	.0047		
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	625	NA		
	Qf	Enter Line 9	x .0057	x .0047	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.2	0.0		
13	χUQ^{-1}	Normalized Concentration (For Yu)	500	NA		
	Qe	Enter Line 8	.0121	.0110		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration-"Maximum Queue"	3.8	0.0		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	NA		
	Qe	Enter Line 8	x .0121	x .0110	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	6.0	0.0		
20	χ	CO Concentration (ppm)-- Total	5.2	0.0		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{5.2\ ppm}$

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Purchase St and I.P. Access Drive

Case # 1 Year 84

1.	Road segment or intersection approach identification	PS
2.	Observed 1-hr volume (vph)	
	Observed 8-hr volume (vph)	
	Projected 1-hr peak demand (vph)	1902
	Projected 8-hr peak demand (vph)	1427
3.	Percentage cold starts	50/20.6
4.	Percentage trucks and buses	5.8 %
5.	Metropolitan population	2.5×10^6
6.	Slope	
7.	Free-flow parameters	
	Number of lanes	3
	Average lane width (ft)	12
	Design speed (mph)	28/35
	Highway type (see Figures 2-5)	Urban Arterial
8.	Intersection parameters	
	Intersection designation	
	Approach width (ft)	
	Percentage right turns	0
	Percentage left turns	0
	Type control and description of signal controller	
9.	Area source parameters	
	Parking lot gate designation	
	Projected 1-hr peak entrance demand (vph)	
	Projected 1-hr peak exit demand (vph)	
	Projected 8-hr peak entrance demand (vph)	
	Projected 8-hr peak exit demand (vph)	
	Parking lot area (m^2)	
	Parking lot capacity (veh)	
	Running time required to access auxiliary parking (s)	
	Facility emptying time	
	Average cars per stall	
	Average area per stall (m^2)	

PS = Purchase Street Southbound

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Purchase St and I.P. Access Drive

Case # 2 Year 90

1.	Road segment or intersection approach identification	PS
2.	Observed 1-hr volume (vph)	
	Observed 8-hr volume (vph)	
	Projected 1-hr peak demand (vph)	3346
	Projected 8-hr peak demand (vph)	2510
3.	Percentage cold starts	50/20.6
4.	Percentage trucks and buses	5.9%
5.	Metropolitan population	2.5×10^6
6.	Slope	
7.	Free-flow parameters	
	Number of lanes	3
	Average lane width (ft)	12
	Design speed (mph)	28/35
	Highway type (see Figures 2-5)	Urban Arterial
8.	Intersection parameters	
	Intersection designation	
	Approach width (ft)	
	Percentage right turns	0
	Percentage left turns	0
	Type control and description of signal controller	
9.	Area source parameters	
	Parking lot gate designation	
	Projected 1-hr peak entrance demand (vph)	
	Projected 1-hr peak exit demand (vph)	
	Projected 8-hr peak entrance demand (vph)	
	Projected 8-hr peak exit demand (vph)	
	Parking lot area (m^2)	
	Parking lot capacity (veh)	
	Running time required to access auxiliary parking (s)	
	Facility emptying time	
	Average cars per stall	
	Average area per stall (m^2)	

* Peak 1-hr volume is constrained to 97% of capacity.

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Purchase St. and I.P. Access Drive

Case # 3 Year 90

1.	Road segment or intersection approach identification	PS	AE
2.	Observed 1-hr volume (vph)		
	Observed 8-hr volume (vph)		
	Projected 1-hr peak demand (vph)	3346	357*
	Projected 8-hr peak demand (vph)	2510	110
3.	Percentage cold starts	50/20.6	
4.	Percentage trucks and buses	5.8%	
5.	Metropolitan population	2.5×10^6	
6.	Slope		
7.	Free-flow parameters		
	Number of lanes	3	1
	Average lane width (ft)	12	12
	Design speed (mph)	28/35	5/5
	Highway type (see Figures 2-5)	Urban Arterial	
8.	Intersection parameters		
	Intersection designation		
	Approach width (ft)		
	Percentage right turns	0	100
	Percentage left turns	0	0
	Type control and description of signal controller		
9.	Area source parameters		
	Parking lot gate designation		
	Projected 1-hr peak entrance demand (vph)		
	Projected 1-hr peak exit demand (vph)		
	Projected 8-hr peak entrance demand (vph)		
	Projected 8-hr peak exit demand (vph)		
	Parking lot area (m^2)		
	Parking lot capacity (veh)		
	Running time required to access auxiliary parking (s)		
	Facility emptying time		
	Average cars per stall		
	Average area per stall (m^2)		

AE = International Place Access Drive Eastbound.

* Peak 1-hr volume is constrained to 97% of capacity.

WORKSHEET B - CAPACITY ANALYSIS

Intersection Purchase St and I.P. Access Drive

Case # 3 Year 90

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	AE	AE	AE	AE
2		Free flow capacity computation:	Case 3	Case 3	Case 4	Case 4
2.1	M_i	Number of lanes	1-hr	8-hr	1-hr	8-hr
2.2	W_r	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification				
3.2	Wa_i	Approach width with parking (ft)				
3.3		Percent right turners				
3.4		Percent left turners				
3.5		Metropolitan area size				
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)				
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume	3346÷3	2510÷3	3113÷3	2485÷3
5.2	C_i	Cross street capacity (1 exit lane)	368	453	371	456
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

AE capacity is based on 4.5 sec critical gap.

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION PURCHASE STREET AND INTERNATIONAL PLACE ACCESS DRIVE
CASE # 1 YEAR· 1984 AVERAGING TIME 1-HOUR

LINE 1	ROAD SEGMENT ID	PS
LINE 2	DEMAND VOLUME (VPH)	1902
LINE 4	CRUISE SPEED (MPH)	28
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 ~~.0385~~ .0409
LINE 6.1	NUMBER OF LANES	3
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0
LINE 6.4	DEMAND VOLUME (VPH)	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0
LINE 6.6	GREEN PHASE LENGTH (S)	0
LINE 6.7	CAPACITY (VPH)	0
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0.0
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.0
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0.0
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0.0
LINE 15	IDLING EMISSION RATE (G/S)	0.0
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0203 [illegible]

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET AND INTERNATIONAL PLACE ACCESS DRIVE
CASE # 1 YEAR: 1984 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	
LINE 2	DEMAND VOLUME (VPH)	1427.	
LINE 4	CRUISE SPEED (MPH)	35	
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0203	.0215
LINE 6.1	NUMBER OF LANES	3	
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0.	
LINE 6.4	DEMAND VOLUME (VPH)	0.	
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0.	
LINE 6.6	GREEN PHASE LENGTH (S)	0.	
LINE 6.7	CAPACITY (VPH)	0.	
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0	
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0	
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0.0	
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0	
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0	
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.0	
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0.0	
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0.0	
LINE 15.	IDLING EMISSION RATE (G/S)	0.0	
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0	
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0	
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	~~0.0080~~	.0095

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET AND INTERNATIONAL PLACE ACCESS DRIVE
CASE # 2 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS
LINE 2	DEMAND VOLUME (VPH)	~~2322~~ 2346
LINE 4	CRUISE SPEED (MPH)	28
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	~~0.0180~~ .0198
LINE 6.1	NUMBER OF LANES	3
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0
LINE 6.4	DEMAND VOLUME (VPH)	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0
LINE 6.6	GREEN PHASE LENGTH (S)	0
LINE 6.7	CAPACITY (VPH)	0
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0.0
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.0
LINE 13	LENGTH OF ACC. AND DEC. (M)	0.0
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	0.0
LINE 15	IDLING EMISSION RATE (G/S)	0.0
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0.0
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	~~0.0116~~ .0174

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET AND INTERNATIONAL PLACE ACCESS DRIVE
CASE # 2 YEAR: 1990 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	PS
LINE 2	DEMAND VOLUME (VPH)	~~1742.~~
LINE 4	CRUISE SPEED (MPH)	35
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	~~0.0100~~ ,)
LINE 6.1	NUMBER OF LANES	3
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0.
LINE 6.4	DEMAND VOLUME (VPH)	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0.
LINE 6.6	GREEN PHASE LENGTH (S)	0.
LINE 6.7	CAPACITY (VPH)	0.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0.0
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.0
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0.0
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0.0
LINE 15.	IDLING EMISSION RATE (G/S)	0.0
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	~~0.0048~~ ,0077

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET AND INTERNATIONAL PLACE DRIVE
CASE # 3 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	AE
LINE 2	DEMAND VOLUME (VPH)	3346	357
LINE 4	CRUISE SPEED (MPH)	28	5
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0198	0 0842
LINE 6.1	NUMBER OF LANES	3	1
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0.
LINE 6.4	DEMAND VOLUME (VPH)	0.	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6.6	GREEN PHASE LENGTH (S)	0	0
LINE 6.7	CAPACITY (VPH)	0	368
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0	32.45
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0 0	141 18
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0	317 49
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 0	0 260
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0 0	0 195
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0 0	0 045
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0 0	2 2
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0 0	141 2
LINE 15	IDLING EMISSION RATE (G/S)	0 0	7 972
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0572
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0340
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0 0184	0 0083

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: PURCHASE STREET AND INTERNATIONAL PLACE ACCESS DRIVE
CASE # 3 YEAR: 1990 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	AE
LINE 2	DEMAND VOLUME (VPH)	2510	110
LINE 4	CRUISE SPEED (MPH)	35	5
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0111	0 0605
LINE 6.1	NUMBER OF LANES	3	1
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0
LINE 6.4	DEMAND VOLUME (VPH)	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6.6	GREEN PHASE LENGTH (S)	0	0
LINE 6.7	CAPACITY (VPH)	0	453
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0 0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0	0 0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 0	0.32
LINE 8.6	LENGTH OF QUEUE (M/LANE)	0 0	1 40
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0	2 55
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	0 260
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0	0 195
LINE 12.	EMISSION RATE FOR ACC AND DEC. (G/M-S)	0 0	0 014
LINE 13.	LENGTH OF ACC AND DEC. (M)	0 0	2.2
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0 0	40 0
LINE 15.	IDLING EMISSION RATE (G/S)	0.0	0 012
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0011
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	-0 0013
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0 0077	0 0018

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase St. and I.P. Access Drive

Case # 1 Year 1984 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS			
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	4			
4	x	Lateral Distance (m)	12			
5	Yu	Maximum Longitudinal Distance (m)	N/A			
6	Yd	Minimum Longitudinal Distance (m)	N/A			
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0			
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0216			
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	800			
	Qf	Enter Line 9	x	x	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	17.3			
13	χUQ^{-1}	Normalized Concentration (For Yu)	N/A			
	Qe	Enter Line 8				
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
15	χ	CO Concentration-"Maximum Queue"				
16	χUQ^{-1}	Normalized Concentration (For Yd)	N/A			
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
18	χ	CO Concentration-"Imaginery Queue"	÷	÷	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	17.3			
20	χ	CO Concentration (ppm)-- Total	15.1			
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{15.1\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase St. and I.P. Access Drive

Case # 1 Year 1984 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream DS			
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	4			
4	x	Lateral Distance (m)	12			
5	Yu	Maximum Longitudinal Distance (m)	N/A			
6	Yd	Minimum Longitudinal Distance (m)	N/A			
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0			
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0085			
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	800			
	Qf	Enter Line 9	x	x	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	4.3			
13	χUQ^{-1}	Normalized Concentration (For Yu)	N/A			
	Qe	Enter Line 8				
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
15	χ	CO Concentration-"Maximum Queue"				
16	χUQ^{-1}	Normalized Concentration (For Yd)	N/A			
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
18	χ	CO Concentration-"Imaginery Queue"	+	+	+	+
19	χ	CO ($mg\ m^{-3}$) Total	4.3			
20	χ	CO Concentration (ppm)-- Total	3.7			
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

3.7ppm

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase St. and I. P. Access Drive

Case # 2 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS			
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	4			
4	x	Lateral Distance (m)	12			
5	Yu	Maximum Longitudinal Distance (m)	N/A			
6	Yd	Minimum Longitudinal Distance (m)	N/A			
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0			
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0184			
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	XUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	800			
	Qf	Enter Line 9	x	x	x	x
11	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷	÷	÷	÷
12	X	CO Concentration ($mg\ m^{-3}$) Through Emissions	14.7			
13	XUQ^{-1}	Normalized Concentration (For Yu)	N/A			
	Qe	Enter Line 8				
14	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
15	X	CO Concentration-"Maximum Queue"				
16	XUQ^{-1}	Normalized Concentration (For Yd)	N/A			
	Qe	Enter Line 8	x	x	x	x
17	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
18	X	CO Concentration-"Imaginery Queue"	÷	÷	÷	÷
19	X	CO ($mg\ m^{-3}$) Total	14.7			
20	X	CO Concentration (ppm)-- Total	12.8			
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	X´	CO Concentration at Height z ($mg\ m^{-3}$)				
24	X´	CO Concentration at Height z (ppm)				

$\boxed{12.8\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase St. and I.P. Access Drive

Case # 2 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS			
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	4			
4	x	Lateral Distance (m)	12			
5	Yu	Maximum Longitudinal Distance (m)	N/A			
6	Yd	Minimum Longitudinal Distance (m)	N/A			
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0			
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0077			
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	800			
	Qf	Enter Line 9	x	x	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	3.9			
13	χUQ^{-1}	Normalized Concentration (For Yu)	N/A			
	Qe	Enter Line 8				
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
15	χ	CO Concentration-"Maximum Queue"				
16	χUQ^{-1}	Normalized Concentration (For Yd)	N/A			
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2				
18	χ	CO Concentration-"Imaginery Queue"	÷	÷	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	3.9			
20	χ	CO Concentration (ppm)-- Total	3.4			
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

3.4ppm

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase St. and I.P. Access Drive

Case # 3 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	AE		
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.0			
3	θ	Wind-Road Angle (deg)	81	9		
4	x	Lateral Distance (m)	12	10		
5	Yu	Maximum Longitudinal Distance (m)	N/A	161		
6	Yd	Minimum Longitudinal Distance (m)	N/A	20		
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0	.0340		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0184	.0083		
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	160	650		
	Qf	Enter Line 9	x	x	x	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	2.9	5.4		
13	χUQ^{-1}	Normalized Concentration (For Yu)	N/A	490		
	Qe	Enter Line 8				
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2				
15	χ	CO Concentration-"Maximum Queue"		16.7		
16	χUQ^{-1}	Normalized Concentration (For Yd)	N/A	0		
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2				
18	χ	CO Concentration-"Imaginery Queue"	÷	÷ 0	÷	÷
19	χ	CO (mg m^{-3}) Total	2.9	22.1		
20	χ	CO Concentration (ppm)-- Total	2.5	19.2		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

21.7ppm

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Oliver And Purchase Streets

Case # 1 Year 1984

1.	Road segment or intersection approach identification	PS	OS
2.	Observed 1-hr volume (vph)	1179	130
	Observed 8-hr volume (vph)	884	77
	Projected 1-hr peak demand (vph)		
	Projected 8-hr peak demand (vph)		
3.	Percentage cold starts	50/20.6	
4.	Percentage trucks and buses	5.8	
5.	Metropolitan population		
6.	Slope		
7.	Free-flow parameters		
	Number of lanes	3	1
	Average lane width (ft)	12	20
	Design speed (mph) (1Hr/8Hr)	28/35	28/30
	Highway type (see Figures 2-5)	Urban Artery	
8.	Intersection parameters		
	Intersection designation		
	Approach width (ft)	36	20
	Percentage right turns	2	100
	Percentage left turns	0	0
	Type control and description of signal controller	STOP SIGN	
9.	Area source parameters		
	Parking lot gate designation		
	Projected 1-hr peak entrance demand (vph)		
	Projected 1-hr peak exit demand (vph)		
	Projected 8-hr peak entrance demand (vph)		
	Projected 8-hr peak exit demand (vph)		
	Parking lot area (m^2)		
	Parking lot capacity (veh)		
	Running time required to access auxiliary parking (s)		
	Facility emptying time		
	Average cars per stall		
	Average area per stall (m^2)		

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Purchase St. and I.P. Access Drive

Case # 3 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream DS	AE		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	12	10		
5	Yu	Maximum Longitudinal Distance (m)	N/A	60		
6	Yd	Minimum Longitudinal Distance (m)	N/A	20		
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0	-.0013		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0077	.0018		
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	XUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	800	160		
	Qf	Enter Line 9	x	x	x	x
11	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	X	CO Concentration ($mg\ m^{-3}$) Through Emissions	3.9	0.2		
13	XUQ^{-1}	Normalized Concentration (For Yu)	N/A	150		
	Qe	Enter Line 8				
14	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	X	CO Concentration-"Maximum Queue"		-0.12		
16	XUQ^{-1}	Normalized Concentration (For Yd)	N/A	60		
	Qe	Enter Line 8	x	x	x	x
17	XU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	X	CO Concentration-"Imaginery Queue"	÷	÷ -0.05	÷	÷
19	X	CO ($mg\ m^{-3}$) Total	3.9	0.1		
20	X	CO Concentration (ppm)-- Total	3.4	0.1		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	X´	CO Concentration at Height z ($mg\ m^{-3}$)				
24	X´	CO Concentration at Height z (ppm)				

3.5 ppm

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Oliver And Purchase Streets

Case # 2 Year 1990

1.	Road segment or intersection approach identification	PS	OS
2.	Observed 1-hr volume (vph)		
	Observed 8-hr volume (vph)		
	Projected 1-hr peak demand (vph)	2468	20
	Projected 8-hr peak demand (vph)	1851	12
3.	Percentage cold starts	50/20.6	
4.	Percentage trucks and buses	5 8	
5.	Metropolitan population		
6.	Slope		
7.	Free-flow parameters		
	Number of lanes	3	2
	Average lane width (ft)	12	19
	Design speed (mph)	28/35	28/30
	Highway type (see Figures 2-5)	Urban Artery	
8.	Intersection parameters		
	Intersection designation		
	Approach width (ft)	36	38
	Percentage right turns	0	100
	Percentage left turns	0	0
	Type control and description of signal controller		
9.	Area source parameters		
	Parking lot gate designation		
	Projected 1-hr peak entrance demand (vph)		
	Projected 1-hr peak exit demand (vph)		
	Projected 8-hr peak entrance demand (vph)		
	Projected 8-hr peak exit demand (vph)		
	Parking lot area (m^2)		
	Parking lot capacity (veh)		
	Running time required to access auxiliary parking (s)		
	Facility emptying time		
	Average cars per stall		
	Average area per stall (m^2)		

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Oliver And Purchase Streets

Case # 3 Year 1990

1.	Road segment or intersection approach identification	PS	OS
2.	Observed 1-hr volume (vph)		
	Observed 8-hr volume (vph)		
	Projected 1-hr peak demand (vph)	2628	50
	Projected 8-hr peak demand (vph)	1971	30
3.	Percentage cold starts	50/20.6	
4.	Percentage trucks and buses	5.8	
5.	Metropolitan population		
6.	Slope		
7.	Free-flow parameters		
	Number of lanes	3	2
	Average lane width (ft)	12	19
	Design speed (mph) (1Hr/8Hr)	28/35	28/30
	Highway type (see Figures 2-5)	Urban Artery	
8.	Intersection parameters		
	Intersection designation		
	Approach width (ft)	36	38
	Percentage right turns	0	100
	Percentage left turns	0	0
	Type control and description of signal controller		
9.	Area source parameters		
	Parking lot gate designation		
	Projected 1-hr peak entrance demand (vph)		
	Projected 1-hr peak exit demand (vph)		
	Projected 8-hr peak entrance demand (vph)		
	Projected 8-hr peak exit demand (vph)		
	Parking lot area (m^2)		
	Parking lot capacity (veh)		
	Running time required to access auxiliary parking (s)		
	Facility emptying time		
	Average cars per stall		
	Average area per stall (m^2)		

WORKSHEET B - CAPACITY ANALYSIS

Intersection Oliver And Purchase Streets

Case # 1 Year 1984

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	PS		OS	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes	3		1	
2.2	W_f	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification				
3.2	Wa_i	Approach width with parking (ft)				
3.3		Percent right turners				
3.4		Percent left turners				
3.5		Metropolitan area size				
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)				
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume (1Hr/8Hr)	1179/884			
5.2	C_i	Cross street capacity			541	599
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

WORKSHEET B - CAPACITY ANALYSIS

Intersection Oliver And Purchase Streets

Case # 2 Year 1990

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	PS		OS	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes	3		2	
2.2	W_f	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification				
3.2	Wa_i	Approach width with parking (ft)				
3.3		Percent right turners				
3.4		Percent left turners				
3.5		Metropolitan area size				
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)				
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume	2468/1851			
5.2	C_i	Cross street capacity			336/425	
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

WORKSHEET B - CAPACITY ANALYSIS

Intersection Oliver And Purchase Streets

Case # 3 Year 1990

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	PS		OS	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes	3		2	
2.2	W_f	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification				
3.2	Wa_i	Approach width with parking (ft)				
3.3		Percent right turners				
3.4		Percent left turners				
3.5		Metropolitan area size				
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)				
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume (1Hr/8Hr)	2628/1971			
5.2	C_i	Cross street capacity			315/406	
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: OLIVER STREET & PURCHASE STREET
CASE # 1 YEAR: 1984 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	OS
LINE 2	DEMAND VOLUME (VPH)	1179	130
LINE 4	CRUISE SPEED (MPH)	28	28
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0409	0 0409
LINE 6 1	NUMBER OF LANES	3	1
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0
LINE 6 4	DEMAND VOLUME (VPH)	0	0.
LINE 6 5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6 6	GREEN PHASE LENGTH (S)	0	0
LINE 6.7	CAPACITY (VPH)	0.	541.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0	0.0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0 0
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0	0.32
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0.0	1 38
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0	2 10
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	0.103
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 0	0.034
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.0	0.005
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0 0	70 1
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	0 0	140.2
LINE 15	IDLING EMISSION RATE (G/S)	0.0	-0.032
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0022
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0023
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0134	0 0015

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: OLIVER STREET & PURCHASE STREET
CASE # 1 YEAR: 1984 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	OS
LINE 2	DEMAND VOLUME (VPH)	884	77
LINE 4	CRUISE SPEED (MPH)	35	30
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0215	0 0256
LINE 6.1	NUMBER OF LANES	3	1
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0.	0.
LINE 6 4	DEMAND VOLUME (VPH)	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0.	
LINE 6.6	GREEN PHASE LENGTH (S)	0	0
LINE 6 7	CAPACITY (VPH)	0	599
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0	0 0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0	0 15
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0 0	0.64
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0 0	0 89
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	0.100
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0 0	0 031
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.0	0.003
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0 0	80 5
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0 0	160 9
LINE 15.	IDLING EMISSION RATE (G/S)	0.0	-0 028
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0	0.0012
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0008
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0 0053	0 0005

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: OLIVER STREET & PURCHASE STREET
CASE # 2 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	OS
LINE 2	DEMAND VOLUME (VPH)	2468	20.
LINE 4	CRUISE SPEED (MPH)	28	28
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0198	0.0198
LINE 6.1	NUMBER OF LANES	3	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0.	0
LINE 6.4	DEMAND VOLUME (VPH)	0.	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6.6	GREEN PHASE LENGTH (S)	0.	0.
LINE 6.7	CAPACITY (VPH)	0	336
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 0	0 06
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0 0	0 14
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0 0	0 68
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	0 103
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0 0	0 034
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0 0	0 001
LINE 13.	LENGTH OF ACC AND DEC. (M)	0.0	70 1
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0 0	140 2
LINE 15.	IDLING EMISSION RATE (G/S)	0.0	-0 007
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0003
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0001
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0.0136	0 0001

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION OLIVER STREET & PURCHASE STREET
CASE # 2 YEAR 1990 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	DS
LINE 2	DEMAND VOLUME (VPH)	1851	12
LINE 4	CRUISE SPEED (MPH)	35	30
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0111	0.0132
LINE 6.1	NUMBER OF LANES	3	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0
LINE 6.4	DEMAND VOLUME (VPH)	0	0
LINE 6 5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6.6	GREEN PHASE LENGTH (S)	0	0
LINE 6.7	CAPACITY (VPH)	0	425
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0 0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0	0 0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 0	0 03
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0 0	0 06
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0 0	0 25
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 0	0 100
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0	0 031
LINE 12	EMISSION RATE FOR ACC AND DEC. (G/M-S)	0.0	0 000
LINE 13.	LENGTH OF ACC AND DEC. (M)	0 0	80 5
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0 0	160 9
LINE 15.	IDLING EMISSION RATE (G/S)	0 0	-0 005
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0002
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0001
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0057	0 0000

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: OLIVER STREET & PURCHASE STREET
CASE # 3 YEAR: 1990 AVERAGING TIME: 1-HOUR

LINE 1	ROAD SEGMENT ID	PS	OS
LINE 2	DEMAND VOLUME (VPH)	2628	50.
LINE 4	CRUISE SPEED (MPH)	28	28
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0198	0 0198
LINE 6.1	NUMBER OF LANES	3	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0
LINE 6 4	DEMAND VOLUME (VPH)	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6.6	GREEN PHASE LENGTH (S)	0.	0
LINE 6.7	CAPACITY (VPH)	0	315
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 0	0 19
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0.0	0 41
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0	2 16
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	0.103
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0	0.034
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0 0	0.002
LINE 13.	LENGTH OF ACC. AND DEC. (M)	0.0	70 1
LINE 14.	LENGTH FOR EXCESS EMISSIONS (M)	0 0	140 2
LINE 15.	IDLING EMISSION RATE (G/S)	0 0	-0.012
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0009
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0	0 0004
LINE 18.	FREE-FLOW EMISSION RATE (G/S-M)	0.0145	0 0003

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: OLIVER STREET & PURCHASE STREET
CASE # 3 YEAR 1990 AVERAGING TIME 8-HOUR

LINE 1	ROAD SEGMENT ID	PS	OS
LINE 2	DEMAND VOLUME (VPH)	1917	30
LINE 4	CRUISE SPEED (MPH)	35	30
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0111	0 0132
LINE 6.1	NUMBER OF LANES	3	2
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0.
LINE 6 4	DEMAND VOLUME (VPH)	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	[illegible]	
LINE 6.6	GREEN PHASE LENGTH (S)	0	0
LINE 6 7	CAPACITY (VPH)	0	406
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0 0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0	0.0
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0	0 08
LINE 8 0	LENGTH OF QUEUE (M/LANE)	0 0	0.17
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0 0	0.71
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 0	0 100
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0 0	0 031
LINE 12	EMISSION RATE FOR ACC AND DEC. (G/M-S)	0 0	0 001
LINE 13	LENGTH OF ACC AND DEC. (M)	0 0	80.5
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	0 0	160 9
LINE 15	IDLING EMISSION RATE (G/S)	0 0	-0.011
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0005
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0001
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0059	0 0001

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Oliver And Purchase Street

Case # 1 Year 1984 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	OS		
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.0			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	15	10		
5	Yu	Maximum Longitudinal Distance (m)	NA	29		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0000	.0023		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0134	.0015		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	690	145		
	Qf	Enter Line 9	x .0134	x .0015	x	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	9.2	0.2		
13	χUQ^{-1}	Normalized Concentration (For Yu)	NA	90		
	Qe	Enter Line 8	.0000	.0023		
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	0.0	0.2		
16	χUQ^{-1}	Normalized Concentration (For Yd)	NA	0		
	Qe	Enter Line 8	x .0000	x .0023	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO (mg m^{-3}) Total	9.2	0.4		
20	χ	CO Concentration (ppm)-- Total	8.0	0.3		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{8.3 \text{ ppm}}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Oliver And Purchase Street

Case # 1 Year 1984 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	OS		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	15	10		
5	Yu	Maximum Longitudinal Distance (m)	NA	29		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0000	.0008		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0053	.0005		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	690	145		
	Qf	Enter Line 9	x .0053	x .0005	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.3	0.05		
13	χUQ^{-1}	Normalized Concentration (For Yu)	NA	90		
	Qe	Enter Line 8	.0000	.0008		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration—"Maximum Queue"	0.0	0.04		
16	χUQ^{-1}	Normalized Concentration (For Yd)	NA	0		
	Qe	Enter Line 8	x .0000	x .0008	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration—"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	2.3	0.09		
20	χ	CO Concentration (ppm)-- Total	2.0	0.08		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{2.1\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Oliver And Purchase Street

Case # 2 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	OS		
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.0			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	15	7		
5	Yu	Maximum Longitudinal Distance (m)	NA	29		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0000	.0001		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0136	.0001		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	690	150		
	Qf	Enter Line 9	x .0136	x .0001	x	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	9.4	0.02		
13	χUQ^{-1}	Normalized Concentration (For Yu)	NA	100		
	Qe	Enter Line 8	.0000	.0001		
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	0	0.01		
16	χUQ^{-1}	Normalized Concentration (For Yd)	NA	0		
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷	÷
19	χ	CO (mg m^{-3}) Total	9.4	0.03		
20	χ	CO Concentration (ppm)-- Total	8.2	0.03		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{8.2\text{ppm}}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Oliver And Purchase Street

Case # 2 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	OS		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	15	7		
5	Yu	Maximum Longitudinal Distance (m)	NA	29		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0.0000	.0001		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0057	.0000		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	690	150		
	Qf	Enter Line 9	x .0057	x .0000	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.5	0.0		
13	χUQ^{-1}	Normalized Concentration (For Yu)	NA	100		
	Qe	Enter Line 8	.0000	.0001		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration-"Maximum Queue"	0	.01		
16	χUQ^{-1}	Normalized Concentration (For Yd)	NA	0		
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	2.5	0.01		
20	χ	CO Concentration (ppm)-- Total	2.2	0.01		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{2.2 ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Oliver And Purchase Street

Case # 3 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	OS		
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.0			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	15	7		
5	Yu	Maximum Longitudinal Distance (m)	NA	29		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0000	.0004		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0145	.0003		
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	690	150		
	Qf	Enter Line 9	x .0145	x .0003	x	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	10.0	0.05		
13	χUQ^{-1}	Normalized Concentration (For Yu)	NA	100		
	Qe	Enter Line 8	.0000	.0004		
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	0.0	0.04		
16	χUQ^{-1}	Normalized Concentration (For Yd)	NA	0		
	Qe	Enter Line 8	x .0000	x .0004	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO (mg m^{-3}) Total	10.0	0.09		
20	χ	CO Concentration (ppm)-- Total	8.7	0.08		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{8.8 ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Oliver And Purchase Streets

Case # 3 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream PS	OS		
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.6			
3	θ	Wind-Road Angle (deg)	4	86		
4	x	Lateral Distance (m)	15	7		
5	Yu	Maximum Longitudinal Distance (m)	NA	29		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0000	.0001		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0059	.0001		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	690	150		
	Qf	Enter Line 9	x .0059	x .0001	x	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	2.5	0.02		
13	χUQ^{-1}	Normalized Concentration (For Yu)	NA	100		
	Qe	Enter Line 8	.0000	.0001		
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration—"Maximum Queue"	0.0	0.01		
16	χUQ^{-1}	Normalized Concentration (For Yd)	NA	0		
	Qe	Enter Line 8	x .0000	x .0001	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration—"Imaginery Queue"	÷ 0.0	÷ 0.0	÷	÷
19	χ	CO (mg m^{-3}) Total	2.5	0.03		
20	χ	CO Concentration (ppm)-- Total	2.2	0.03		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{2.2\text{ppm}}$

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Northern Ave And Atlantic Ave

Case # 1 Year 1984

		AN	NW
1.	Road segment or intersection approach identification	AN	NW
2.	Observed 1-hr volume (vph)	2022	1478
	Observed 8-hr volume (vph)	1597	1079
	Projected 1-hr peak demand (vph)		
	Projected 8-hr peak demand (vph)		
3.	Percentage cold starts	50/20.6	
4.	Percentage trucks and buses	3.8	
5.	Metropolitan population		
6.	Slope		
7.	Free-flow parameters		
	Number of lanes	3	4
	Average lane width (ft)	18	12
	Design speed (mph) (1Hr/8Hr)	24/29	21/33
	Highway type (see Figures 2-5)	Urban Artery	
8.	Intersection parameters		
	Intersection designation		
	Approach width (ft)		
	Percentage right turns	15	100
	Percentage left turns	0	0
	Type control and description of signal controller	STOP SIGN	
9.	Area source parameters		
	Parking lot gate designation		
	Projected 1-hr peak entrance demand (vph)		
	Projected 1-hr peak exit demand (vph)		
	Projected 8-hr peak entrance demand (vph)		
	Projected 8-hr peak exit demand (vph)		
	Parking lot area (m^2)		
	Parking lot capacity (veh)		
	Running time required to access auxiliary parking (s)		
	Facility emptying time		
	Average cars per stall		
	Average area per stall (m^2)		

Note: The AN volumes contain the expressway off-ramp traffic which merges into Atlantic Ave. before the intersectio

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Northern Ave And Atlantic Ave

Case # 2 Year 1990

1.	Road segment or intersection approach identification	AN	NN	RE
2.	Observed 1-hr volume (vph)			
	Observed 8-hr volume (vph)			
	Projected 1-hr peak demand (vph)	1784	1825	643
	Projected 8-hr peak demand (vph)	1409	1332	508
3.	Percentage cold starts	50/20.6		
4.	Percentage trucks and buses	3.8		
5.	Metropolitan population			
6.	Slope			
7.	Free-flow parameters			
	Number of lanes	4	3	2
	Average lane width (ft)	12	15	20
	Design speed (mph)	24/29	21/33	24/29
	Highway type (see Figures 2-5)	Urban Arterial		
8.	Intersection parameters			
	Intersection designation			
	Approach width (ft)			
	Percentage right turns	17	100	0
	Percentage left turns	0	0	0
	Type control and description of signal controller	Signal		
9.	Area source parameters			
	Parking lot gate designation			
	Projected 1-hr peak entrance demand (vph)			
	Projected 1-hr peak exit demand (vph)			
	Projected 8-hr peak entrance demand (vph)			
	Projected 8-hr peak exit demand (vph)			
	Parking lot area (m^2)			
	Parking lot capacity (veh)			
	Running time required to access auxiliary parking (s)			
	Facility emptying time			
	Average cars per stall			
	Average area per stall (m^2)			

Ramp left turn has no conflicts

WORKSHEET 1 - TRAFFIC INFORMATION

Intersection Northern Ave And Atlantic Ave

Case # 3 Year 1990

1.	Road segment or intersection approach identification	AN	NN	RE
2.	Observed 1-hr volume (vph)			
	Observed 8-hr volume (vph)			
	Projected 1-hr peak demand (vph)	1863	1825	643
	Projected 8-hr peak demand (vph)	1472	1332	508
3.	Percentage cold starts	50/20.6		
4.	Percentage trucks and buses	3.8		
5.	Metropolitan population			
6.	Slope			
7.	Free-flow parameters			
	Number of lanes	4	3	2
	Average lane width (ft)	12	15	20
	Design speed (mph)	24/29	21/33	24/29
	Highway type (see Figures 2-5)	Urban Arterial		
8.	Intersection parameters			
	Intersection designation			
	Approach width (ft)			
	Percentage right turns	17	100	0
	Percentage left turns	0	0	0
	Type control and description of signal controller			
9.	Area source parameters			
	Parking lot gate designation			
	Projected 1-hr peak entrance demand (vph)			
	Projected 1-hr peak exit demand (vph)			
	Projected 8-hr peak entrance demand (vph)			
	Projected 8-hr peak exit demand (vph)			
	Parking lot area (m^2)			
	Parking lot capacity (veh)			
	Running time required to access auxiliary parking (s)			
	Facility emptying time			
	Average cars per stall			
	Average area per stall (m^2)			

WORKSHEET B - CAPACITY ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 1 Year 1984

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	AN		NN	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes				
2.2	W_f	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification				
3.2	Wa_i	Approach width with parking (ft)				
3.3		Percent right turners				
3.4		Percent left turners				
3.5		Metropolitan area size				
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)				
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j})$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume (excl. right turns)	1710/1351			
5.2	C_i	Cross street capacity (1 Hr/8 Hr)			1857/2194	
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

Northern Ave Lane No.	1-Hour V_m+V_n	1-Hour C_i	8-Hour V_m+V_n	8-Hour C_i
1	1120	568	885	622
2	1378	489	1089	578
3	1710	400	1351	497
4	1710	400	1351	497

WORKSHEET B - CAPACITY ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 2, 3 Year 1990

Step	Symbol	Input/Units				
1	i	Road segment (or approach) designation	AN	NW	RF	
2		Free flow capacity computation:				
2.1	M_i	Number of lanes				
2.2	W_f	Adjustment for lane width (Table B-1)				
2.3	T_i	Adjustment for trucks (Table B-2)				
2.4	C_i	Free flow capacity				
3		Signalized intersection capacity:				
3.1	j	Green signal phase identification	A	D	C	B
3.2	Wa_i	Approach width with parking (ft)	44	12	53	48
3.3		Percent right turners	0	100	100	0
3.4		Percent left turners	0	0	0	0
3.5		Metropolitan area size				
3.6	$Cs_{i,j}$	Capacity service volume (vph or green)	4800	1000	5800	5400
4		Signalized intersection green phase and cycle length:				
4.1	$V_{i,j}$	Demand Volume for approach and phase				
4.2	$V_{i,j}/Cs_{i,j}$	Volume to green capacity ratio				
4.3	approx G/Cy	Approximate G/Cy				
4.4	$\Sigma_j \max(V_{i,j}/Cs_{i,j})$	Sum of the maximum V/C ratios for each signal phase				
4.5	Cy	Signal cycle time (sec)				
4.6	Gj	Green phase length				
4.7	Gj/Cy	Green phase to cycle time ratio				
4.8	$C_{i,j}$	Capacity for approach i phase j				
5		Two-way stop, two-way yield or uncontrolled intersection:				
5.1	V_m+V_n	Major street two-way volume				
5.2	C_i	Cross street capacity				
6		Four-way stop intersections:				
6.1	V_i	Approach volume				
6.2	Spi	Demand split on cross streets				
6.3	C_i	Capacity of approach				
7	C_i	Approach capacity $\Sigma_j C_{i,j}$ 5.2 for a four-way stop or 6.3 for a two-way stop				

ϕA Atlantic Ave 30 s.

ϕB Offramp and Atlantic Right Turn 25 s.

ϕC Northern Ave. and Atlantic Right Turn 35 s

Total 90 s.

Signal times assume traffic moves on amber

$\phi D = \phi A + \phi B + \phi C = 90s.$

Parking on east side of Atlantic Ave. Reduces Approach Capacity For Right Turns.

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION· NORTHERN AVE AND ATLANTIC AVE
CASE # 1 YEAR 1984 AVERAGING TIME· 1-HOUR

LINE 1	ROAD SEGMENT ID	AN	NW
LINE 2	DEMAND VOLUME (VPH)	2022.	1478
LINE 4	CRUISE SPEED (MPH)	24	21
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0480	0 0541
LINE 6 1	NUMBER OF LANES	3	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0	0
LINE 6 4	DEMAND VOLUME (VPH)	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6 6	GREEN PHASE LENGTH (S)	0	0.
LINE 6 7	CAPACITY (VPH)	0	1857
LINE 6 8	PROPORTION OF VEHICLES THAT STOP	0 0	0.0
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0 0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0.0	3.90
LINE 8.0	LENGTH OF QUEUE (M/LANE)	0 0	4 24
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0 0	7 56
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 0	0 125
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0.0	0 044
LINE 12	EMISSION RATE FOR ACC AND DEC. (G/M-S)	0 0	0 069
LINE 13	LENGTH OF ACC AND DEC. (M)	0 0	39 4
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	0 0	78 9
LINE 15	IDLING EMISSION RATE (G/S)	0 0	0 350
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0391
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0431
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0270	0 0222

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION· NORTHERN AVE AND ATLANTIC AVE
CASE # 1 YEAR· 1984 AVERAGING TIME· 8-HOUR

LINE 1	ROAD SEGMENT ID	AN	NW
LINE 2	DEMAND VOLUME (VPH)	1597	1079
LINE 4	CRUISE SPEED (MPH)	29	33
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0266	0 0229
LINE 6 1	NUMBER OF LANES	3	4
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	0.	0
LINE 6 4	DEMAND VOLUME (VPH)	0	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	0	
LINE 6 6	GREEN PHASE LENGTH (S)	0	0.
LINE 6 7	CAPACITY (VPH)	0.	2194
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0 0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	0 0	0.97
LINE 8 0	LENGTH OF QUEUE (M/LANE)	0 0	1.05
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	0.0	1.59
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.0	0.096
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 0	0 029
LINE 12	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0 0	0 037
LINE 13	LENGTH OF ACC AND DEC (M)	0 0	97.4
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	0 0	194 7
LINE 15	IDLING EMISSION RATE (G/S)	0.0	-0 382
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0	0 0168
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0	0 0121
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0118	0 0069

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: NORTHERN AVE AND ATLANTIC AVE
CASE # 2 YEAR: 1990 AVERAGING TIME 1-HOUR

LINE 1	ROAD SEGMENT ID	AN	NW	RE
LINE 2	DEMAND VOLUME (VPH)	1784	1825	643
LINE 4	CRUISE SPEED (MPH)	24	21	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0232	0 0261	0 0232
LINE 6.1	NUMBER OF LANES	4	3	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	4800	5800	5400
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	1000	0	0
LINE 6 4	DEMAND VOLUME (VPH)	1476	1825	643
LINE 6.4	DEMAND VOLUME (VPH)	308	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90		
LINE 6 6	GREEN PHASE LENGTH (S)	30	35	25
LINE 6 6	GREEN PHASE LENGTH (S)	90	0	0
LINE 6.7	CAPACITY (VPH)	2600	2256	1500
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 963	0 892	0.820
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0 0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	35.523	40 683	13 179
LINE 6 9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0	0.0	0 0
LINE 7 0	AVERAGE NUMBER OF VEHICLES IN QUEUE	2.19	4 24	0 75
LINE 8.0	LENGTH OF QUEUE (M/LANE)	41.01	65 14	30 30
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	26 92	31 29	28 45
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 113	0 125	0 113
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 039	0 044	0 039
LINE 12	EMISSION RATE FOR ACC AND DEC (G/M-S)	0 060	0 076	0 022
LINE 13	LENGTH OF ACC AND DEC (M)	51 5	39 4	51 5
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	103 0	78 9	103 0
LINE 15	IDLING EMISSION RATE (G/S)	2 784	3 488	1 073
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0570	0 0824	0 0215
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0330	0 0492	0 0125
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0115	0 0132	0 0041

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION· NORTHERN AVE AND ATLANTIC AVE
CASE # 2 YEAR: 1990 AVERAGING TIME· 8-HOUR

LINE 1	ROAD SEGMENT ID	AN	NW	RE
LINE 2	DEMAND VOLUME (VPH)	1409	1332.	508.
LINE 4	CRUISE SPEED (MPH)	29	33	29
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0137	0.0118	0 0137
LINE 6 1	NUMBER OF LANES	4	3	2
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	4800.	5800	5400
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	1000	0	0
LINE 6 4	DEMAND VOLUME (VPH)	1166	1332.	508.
LINE 6 4	DEMAND VOLUME (VPH)	243	0.	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90		
LINE 6 6	GREEN PHASE LENGTH (S)	30	35.	25
LINE 6 6	GREEN PHASE LENGTH (S)	90	[illegible]	0.
LINE 6 7	CAPACITY (VPH)	2600	2256.	1500
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.881	0 793	0.797
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0	0 0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	25 669	26 417	10 125
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0 0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	1 18	1 44	0.51
LINE 8.0	LENGTH OF QUEUE (M/LANE)	29.20	40 40	23.13
LINE 9 0	AVERAGE EXCESS RUNNING TIME (S/VEH)	23 50	24.12	27 14
LINE 10	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 101	0 096	0 101
LINE 11	EMISSIONS FROM DECELERATION (G/VEH-M)	0 032	0 029	0.032
LINE 12	EMISSION RATE FOR ACC AND DEC (G/M-S)	0.038	0 037	0.015
LINE 13	LENGTH OF ACC AND DEC (M)	75 2	97 4	75.2
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	150 4	194 7	150 4
LINE 15	IDLING EMISSION RATE (G/S)	1 760	1 646	0 765
LINE 16	AVERAGE EMISSION RATE (G/S-M)	0 0307	0 0268	0 0126
LINE 17	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0123	0 0107	0 0051
LINE 18	FREE-FLOW EMISSION RATE (G/S-M·	0 0054	0 0044	0.0019

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION· NORTHERN AVE AND ATLANTIC AVE
CASE # 3 YEAR· 1990 AVERAGING TIME· 1-HOUR

LINE 1	ROAD SEGMENT ID	AN	NW	RE
LINE 2	DEMAND VOLUME (VPH)	1863	1825	643
LINE 4	CRUISE SPEED (MPH)	24	21	24
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0 0232	0 0261	0 0232
LINE 6 1	NUMBER OF LANES	[illegible]	3	2
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	4800	5800	5400
LINE 6 3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	1000	0	0
LINE 6.4	DEMAND VOLUME (VPH)	1555	1825	643
LINE 6 4	DEMAND VOLUME (VPH)	308	0	0
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90		
LINE 6.6	GREEN PHASE LENGTH (S)	30	35	25
LINE 6.6	GREEN PHASE LENGTH (S)	90	0	[illegible]
LINE 6.7	CAPACITY (VPH)	2600	2256	1500
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 986	0 892	0 820
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0 0	0 0	0 0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	38 336	40 683	13 179
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0 0	0.0	0 0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	2.53	4 24	0 75
LINE 8.0	LENGTH OF QUEUE (M/LANE)	44 44	65 14	30 30
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	28 19	31 29	28 45
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0 113	0 125	0.113
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0 039	0 044	0 039
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0 065	0 076	0 022
LINE 13	LENGTH OF ACC AND DEC (M)	51 5	39 4	51 5
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	103 0	78 9	103 0
LINE 15.	IDLING EMISSION RATE (G/S)	3 075	3 488	1 073
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0 0622	0 0824	0 0215
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0 0362	0 0492	0 0125
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0 0120	0 0132	0 0041

EPA VOLUME 9 (REVISED) INDIRECT SOURCE GUIDELINE MODEL - WORKSHEET #2

INTERSECTION: NORTHERN AVE AND ATLANTIC AVE
CASE # 3 YEAR: 1990 AVERAGING TIME: 8-HOUR

LINE 1	ROAD SEGMENT ID	AN	NW	RE
LINE 2	DEMAND VOLUME (VPH)	1472	1332	508
LINE 4	CRUISE SPEED (MPH)	29	33	29
LINE 5	FREE-FLOW EMISSIONS (G-VEH/M)	0.0137	0.0118	0.0137
LINE 6.1	NUMBER OF LANES	4	3	2
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	4800	5800	5400
LINE 6.3	CAPACITY SERVICE VOLUME (VPH OF GREEN)	1000	0.	0.
LINE 6.4	DEMAND VOLUME (VPH)	1229	1332	508
LINE 6.4	DEMAND VOLUME (VPH)	243	0	0.
LINE 6.5	SIGNAL CYCLE LENGTH (S)	90		
LINE 6.6	GREEN PHASE LENGTH (S)	30	35	25
LINE 6.6	GREEN PHASE LENGTH (S)	90	0	0
LINE 6.7	CAPACITY (VPH)	2600	2256	1500.
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.896	0.793	0.797
LINE 6.8	PROPORTION OF VEHICLES THAT STOP	0.0	0.0	0.0
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	27.533	26.417	10.125
LINE 6.9	NUMBER OF VEHICLES THAT STOP PER CYCLE	0.0	0.0	0.0
LINE 7.0	AVERAGE NUMBER OF VEHICLES IN QUEUE	1.30	1.44	0.51
LINE 8.0	LENGTH OF QUEUE (M/LANE)	31.36	40.40	23.13
LINE 9.0	AVERAGE EXCESS RUNNING TIME (S/VEH)	24.25	24.12	27.14
LINE 10.	EMISSIONS FROM ACCELERATION (G/VEH-M)	0.101	0.096	0.101
LINE 11.	EMISSIONS FROM DECELERATION (G/VEH-M)	0.032	0.029	0.032
LINE 12.	EMISSION RATE FOR ACC. AND DEC. (G/M-S)	0.041	0.037	0.015
LINE 13.	LENGTH OF ACC. AND DEC. (M)	75.2	97.4	75.2
LINE 14	LENGTH FOR EXCESS EMISSIONS (M)	150.4	194.7	150.4
LINE 15.	IDLING EMISSION RATE (G/S)	1.916	1.646	0.765
LINE 16.	AVERAGE EMISSION RATE (G/S-M)	0.0331	0.0268	0.0126
LINE 17.	ADJUSTED EXCESS EMISSION RATE (G/S-M)	0.0133	0.0107	0.0051
LINE 18	FREE-FLOW EMISSION RATE (G/S-M)	0.0056	0.0044	0.0019

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 1 Year 1984 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream AN	NW		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)				
4	x	Lateral Distance (m)	38	32		
5	Yu	Maximum Longitudinal Distance (m)	NA	50		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0.0	.0431		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0270	.0222		
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	195	140		
	Qf	Enter Line 9	x .0270	x .0222	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	5.3	3.1		
13	χUQ^{-1}	Normalized Concentration (For Yu)	0	124		
	Qe	Enter Line 8	0	.0431		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	0	5.3		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0		
	Qe	Enter Line 8	x 0	x .0431	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	5.3	8.4		
20	χ	CO Concentration (ppm)-- Total	4.6	7.3		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{11.9\text{ppm}}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 1 Year 1984 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream AN	NW		
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	30	60		
4	x	Lateral Distance (m)	38	32		
5	Yu	Maximum Longitudinal Distance (m)	NA	50		
6	Yd	Minimum Longitudinal Distance (m)	NA	0		
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	0.0	.0121		
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0118	.0069		
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	195	140		
	Qf	Enter Line 9	x .0118	x .0069	x	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	1.4	0.6		
13	χUQ^{-1}	Normalized Concentration (For Yu)	0	129		
	Qe	Enter Line 8	.0	.0121		
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration—"Maximum Queue"	0	0.9		
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0		
	Qe	Enter Line 8	x .0	x .0121	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration—"Imaginery Queue"	÷ 0	÷ 0	÷	÷
19	χ	CO ($mg\ m^{-3}$) Total	1.4	1.5		
20	χ	CO Concentration (ppm)— Total	1.2	1.3		
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{2.5ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 2 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream AN	NN	RE	
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	30	60	5	
4	x	Lateral Distance (m)	50	30	34	
5	Yu	Maximum Longitudinal Distance (m)	165	50	178	
6	Yd	Minimum Longitudinal Distance (m)	62	0	75	
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0330	.0492	.0125	
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0115	.0132	.0041	
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	180	150	410	
	Qf	Enter Line 9	x .0115	x .0132	x .0041	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.1	2.0	1.7	
13	χUQ^{-1}	Normalized Concentration (For Yu)	190	110	40	
	Qe	Enter Line 8	.0330	.0492	.0125	
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	6.3	5.4	0.5	
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷
19	χ	CO ($mg\ m^{-3}$) Total	8.4	7.4	2.2	
20	χ	CO Concentration (ppm)-- Total	7.3	6.4	1.9	
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{15.6\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 2 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream AN	NW	RE	
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.6			
3	θ	Wind-Road Angle (deg)	30	60	5	
4	x	Lateral Distance (m)	50	30	34	
5	Yu	Maximum Longitudinal Distance (m)	212	50	225	
6	Yd	Minimum Longitudinal Distance (m)	62	0	75	
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0123	.0107	.0051	
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0054	.0044	.0019	
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	180	150	40	
	Qf	Enter Line 9	x .0054	x .0044	x .0019	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	0.6	0.4	0.5	
13	χUQ^{-1}	Normalized Concentration (For Yu)	190	110	60	
	Qe	Enter Line 8	.0123	.0107	.0051	
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration--"Maximum Queue"	1.5	0.7	0.2	
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration--"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷
19	χ	CO ($mg\ m^{-3}$) Total	2.1	1.1	0.7	
20	χ	CO Concentration (ppm)-- Total	1.8	1.0	0.6	
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{3.4\ ppm}$

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Northern Ave And Atlantic Ave.
Case # 3 Year 1990 Averaging Time 1 Hour

Line No.	Symbol	Input/Units	Traffic Stream AN	NN	RE	
1	SC	Stability Class	D			
2	U	Wind Speed ($m\ s^{-1}$)	1.0			
3	θ	Wind-Road Angle (deg)	30	60	5	
4	x	Lateral Distance (m)	50	30	34	
5	Yu	Maximum Longitudinal Distance (m)	165	50	178	
6	Yd	Minimum Longitudinal Distance (m)	62	0	75	
7	σ_{zo}	Initial Dispersion (m)	5.0			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0362	.0492	.0125	
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0120	.0132	.0041	
9a		Street Canyon? Yes or No	No			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	180	150	410	
	Qf	Enter Line 9	x .0120	x .0132	x .0041	x
11	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.0	÷	÷	÷
12	χ	CO Concentration ($mg\ m^{-3}$) Through Emissions	2.2	2.0	1.7	
13	χUQ^{-1}	Normalized Concentration (For Yu)	190	110	40	
	Qe	Enter Line 8	.0362	.0492	.0125	
14	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
15	χ	CO Concentration-"Maximum Queue"	6.9	5.4	0.5	
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration ($mg\ m^{-2}s^{-1}$)				
	U	Enter Line 2	1.0			
18	χ	CO Concentration-"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷
19	χ	CO ($mg\ m^{-3}$) Total	9.1	7.4	2.2	
20	χ	CO Concentration (ppm)-- Total	7.9	6.4	1.9	$\boxed{16.2 ppm}$
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z ($mg\ m^{-3}$)				
24	χ'	CO Concentration at Height z (ppm)				

WORKSHEET 5 - INTERSECTION CO DISPERSION ANALYSIS

Intersection Northern Ave And Atlantic Ave

Case # 3 Year 1990 Averaging Time 8 Hour

Line No.	Symbol	Input/Units	Traffic Stream AN	NW	RE	
1	SC	Stability Class	D			
2	U	Wind Speed (m s^{-1})	1.6			
3	θ	Wind-Road Angle (deg)	30	60	5	
4	x	Lateral Distance (m)	50	30	34	
5	Yu	Maximum Longitudinal Distance (m)	212	50	225	
6	Yd	Minimum Longitudinal Distance (m)	62	0	75	
7	σ_{zo}	Initial Dispersion (m)	5			
8	Qe	Excess Emissions Rate ($gm^{-1}s^{-1}$)	.0133	.0107	.0051	
9	Qf	Free Flow Emissions Rate ($gm^{-1}s^{-1}$)	.0056	.0044	.0019	
9a		Street Canyon? Yes or No	NO			
		DISPERSION ANALYSIS				
10	χUQ^{-1}	Normalized Concentration ($10^{-3}m^{-1}$) Free Flow	180	150	410	
	Qf	Enter Line 9	x .0056	x .0044	x .0019	x
11	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	÷ 1.6	÷	÷	÷
12	χ	CO Concentration (mg m^{-3}) Through Emissions	0.6	0.4	0.5	
13	χUQ^{-1}	Normalized Concentration (For Yu)	190	110	60	
	Qe	Enter Line 8	.0133	.0107	.0051	
14	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
15	χ	CO Concentration--"Maximum Queue"	1.6	0.7	0.2	
16	χUQ^{-1}	Normalized Concentration (For Yd)	0	0	0	
	Qe	Enter Line 8	x	x	x	x
17	χU	Normalized Concentration (mg $m^{-2}s^{-1}$)				
	U	Enter Line 2	1.6			
18	χ	CO Concentration--"Imaginery Queue"	÷ 0	÷ 0	÷ 0	÷
19	χ	CO (mg m^{-3}) Total	2.2	1.1	0.7	
20	χ	CO Concentration (ppm)-- Total	1.9	1.0	0.6	
		OPTIONAL z-CORRECTION (Heights Other than 1.8m Above the Ground)				
21	z	Height of Receptor (m)				
22		z-Correction Factor				
23	χ'	CO Concentration at Height z (mg m^{-3})				
24	χ'	CO Concentration at Height z (ppm)				

$\boxed{3.5\text{ ppm}}$

AQ APPENDIX C

PARKING FACILITY WORKSHEETS

WORKSHEET 3 - AREA SOURCE EMISSIONS COMPUTATION

Area Source Existing Parking Lot

Case # 1 Year 1984 Averaging Time 1 Hour

Step	Symbol	Input/Units	Traffic Stream			
1	Brt	Base running time	In	Out		
1.1		Base approach time(s)	0.7			
1.2		Base entrance time(s)	5			
1.3		Base movement-in time(s)	18.8			
1.4		Base stop, base start time(s)	10			
1.5		Base movement-out time(s)	18.8			
1.6		Base exit time(s)	10			
1.7		Base departure time(s)	0.7			
1.8		Total base running time(s)	64			
2	A	Area of parking lot (m^2)	2865			
3	i	Entrance approach identification	In			
4	Ve_i	Entrance demand volume (vph)	20			
5	Ce_i	Entrance approach capacities (vph)	360*			
6	i	Exit approach identification		Out		
7	Vx_i	Exit demand volume (vph)		100		
8	Cx_i	Exit approach capacities (vph)		417**		
9		Number of parking spaces occupied				
10	F	Emissions (g/s-veh)	.212	.750		
11	Pc	Capacity of parking lot (veh)	167			
12	Rmi	Excess movement-in time(s)	0			
13	Fet	Facility emptying time(s)	1442			
14		Excess running time				
14.1	Ve_i/Ce_i	Entering volume-to-capacity ratio	.05			
14.2	Vx_i/Cx_i	Exiting volume-to-capacity ratio		.24		
14.3	Re_i	Excess running time entering parking lot	0.6			
14.4	Rx_i	Excess running time exiting parking lot		2.7		
15	Te_i	Total entering running time (s/veh)	32.6			
16	Rmo	Excess running time moving out of parking stalls (s/veh)		120		
17	Tx_i	Total exiting running time (s/veh)		155		
18	Qa	Total emission rate from a parking lot (g/m^2 - s)	$1.14(10^{-3})$			
19	Qa'	Area source emission rate without the emissions from internal road segment. i				

* Assumes a capacity consistent with an extrance time of 10 seconds per vehicle.

** Cross Street capacity assuming a 4.5s critical gap.

WORKSHEET 3 - AREA SOURCE EMISSIONS COMPUTATION

Area Source Existing Parking Lot

Case # 1 Year 1984 Averaging Time 8 Hour

Step	Symbol	Input/Units	Traffic Stream			
1	Brt	Base running time	In	Out		
1.1		Base approach time(s)	0.7			
1.2		Base entrance time(s)	5			
1.3		Base movement-in time(s)	18.8			
1.4		Base stop, base start time(s)	10			
1.5		Base movement-out time(s)	18.8			
1.6		Base exit time(s)	10			
1.7		Base departure time(s)	0.7			
1.8		Total base running time(s)	64			
2	A	Area of parking lot (m^2)	2865			
3	i	Entrance approach identification	In			
4	Ve_i	Entrance demand volume (vph)	20			
5	Ce_i	Entrance approach capacities (vph)	360			
6	i	Exit approach identification		Out		
7	Vx_i	Exit demand volume (vph)		20		
8	Cx_i	Exit approach capacities (vph)		496		
9		Number of parking spaces occupied				
10	F	Emissions	.212	.750		
11	Pc	Capacity of parking lot (veh)	167			
12	Rmi	Excess movement-in time(s)	0			
13	Fet	Facility emptying time(s)	1442			
14		Excess running time				
14.1	Ve_i/Ce_i	Entering volume-to-capacity ratio	0.06			
14.2	Vx_i/Cx_i	Exiting volume-to-capacity ratio		0.04		
14.3	Re_i	Excess running time entering parking lot	0.6			
14.4	Rx_i	Excess running time exiting parking lot		0.3		
15	Te_i	Total entering running time (s/veh)	32.6			
16	Rmo	Excess running time moving out of parking stalls (s/veh)		120		
17	Tx_i	Total exiting running time (s/veh)		152		
18	Qa	Total emission rate from a parking lot ($g/m^2 - s$)	$2.35(10^{-4})$			
19	Qa'	Area source emission rate without the emissions from internal road segment. i				

WORKSHEET 3 - AREA SOURCE EMISSIONS COMPUTATION

Area Source Existing Parking Lot

Case # 2 Year 1990 Averaging Time 1 Hour

Step	Symbol	Input/Units	Traffic Stream			
1	Brt	Base running time	In	Out		
1.1		Base approach time(s)	0.7			
1.2		Base entrance time(s)	5			
1.3		Base movement-in time(s)	18.8			
1.4		Base stop, base start time(s)	10			
1.5		Base movement-out time(s)	18.8			
1.6		Base exit time(s)	10			
1.7		Base departure time(s)	0.7			
1.8		Total base running time(s)	64			
2	A	Area of parking lot (m^2)	2865			
3	i	Entrance approach identification	In			
4	Ve_i	Entrance demand volume (vph)	20			
5	Ce_i	Entrance approach capacities (vph)	360			
6	i	Exit approach identification		Out		
7	Vx_i	Exit demand volume (vph)		100		
8	Cx_i	Exit approach capacities (vph)		236		
9		Number of parking spaces occupied				
10	F	Emissions	.109	.312		
11	Pc	Capacity of parking lot (veh)	167			
12	Rmi	Excess movement-in time(s)	0			
13	Fet	Facility emptying time(s)	2547			
14		Excess running time				
14.1	Ve_i/Ce_i	Entering volume-to-capacity ratio	.05			
14.2	Vx_i/Cx_i	Exiting volume-to-capacity ratio		.42		
14.3	Re_i	Excess running time entering parking lot	0.6			
14.4	Rx_i	Excess running time exiting parking lot		11.2		
15	Te_i	Total entering running time (s/veh)	32.6			
16	Rmo	Excess running time moving out of parking stalls (s/veh)		211		
17	Tx_i	Total exiting running time (s/veh)		254		
18	Qa	Total emission rate from a parking lot ($g/m^2 - s$)	$7.75(10^{-7})$			
19	Qa'	Area source emission rate without the emissions from internal road segment. i				

WORKSHEET 3 - AREA SOURCE EMISSIONS COMPUTATION

Area Source Existing Parking Lot

Case # 2 Year 1990 Averaging Time 8 Hour

Step	Symbol	Input/Units	Traffic Stream			
1	Brt	Base running time	In	Out		
1.1		Base approach time(s)	0.7			
1.2		Base entrance time(s)	5			
1.3		Base movement-in time(s)	18.8			
1.4		Base stop, base start time(s)	10			
1.5		Base movement-out time(s)	18.8			
1.6		Base exit time(s)	10			
1.7		Base departure time(s)	0.7			
1.8		Total base running time(s)	64			
2	A	Area of parking lot (m^2)	2865			
3	i	Entrance approach identification	In			
4	Ve_i	Entrance demand volume (vph)	20			
5	Ce_i	Entrance approach capacities (vph)	360			
6	i	Exit approach identification		Out		
7	Vx_i	Exit demand volume (vph)		20		
8	Cx_i	Exit approach capacities (vph)		330		
9		Number of parking spaces occupied				
10	F	Emissions	.109	.312		
11	Pc	Capacity of parking lot (veh)	167			
12	Rmi	Excess movement-in time(s)	0			
13	Fet	Facility emptying time(s)	2547			
14		Excess running time				
14.1	Ve_i/Ce_i	Entering volume-to-capacity ratio	.05			
14.2	Vx_i/Cx_i	Exiting volume-to-capacity ratio		.06		
14.3	Re_i	Excess running time entering parking lot	0.6			
14.4	Rx_i	Excess running time exiting parking lot		0.7		
15	Te_i	Total entering running time (s/veh)	32.6			
16	Rmo	Excess running time moving out of parking stalls (s/veh)		211		
17	Tx_i	Total exiting running time (s/veh)		244		
18	Qa	Total emission rate from a parking lot ($g/m^2 - s$)	$1.54 (10^{-4})$			
19	Qa'	Area source emission rate without the emissions from internal road segment. i				

WORKSHEET 3 - AREA SOURCE EMISSIONS COMPUTATION

Area Source IP Parking Garage

Case # 3 Year 1990 Averaging Time 1 Hour

Step	Symbol	Input/Units	Traffic Stream			
1	Brt	Base running time	IN	OUT		
1.1		Base approach time(s)	0.7			
1.2		Base entrance time(s)	5			
1.3		Base movement-in time(s)	109			
1.4		Base stop, base start time(s)	10			
1.5		Base movement-out time(s)	93			
1.6		Base exit time(s)	10			
1.7		Base departure time(s)	0.7			
1.8		Total base running time(s)	228			
2	A	Area of parking lot (m^2)				
3	i	Entrance approach identification	In			
4	Ve_i	Entrance demand volume (vph)	85			
5	Ce_i	Entrance approach capacities (vph)	720*			
6	i	Exit approach identification		Out		
7	Vx_i	Exit demand volume (vph)		357		
8	Cx_i	Exit approach capacities (vph)		368**		
9		Number of parking spaces occupied				
10	F	Emissions	.109	.312		
11	Pc	Capacity of parking lot (veh)	800			
12	Rmi	Excess movement-in time(s)	0.			
13	Fet	Facility emptying time(s)	8000			
14		Excess running time				
14.1	Ve_i/Ce_i	Entering volume-to-capacity ratio	.12			
14.2	Vx_i/Cx_i	Exiting volume-to-capacity ratio		.97		
14.3	Re_i	Excess running time entering parking lot	.67			
14.4	Rx_i	Excess running time exiting parking lot		196		
15	Te_i	Total entering running time (s/veh)	115			
16	Rmo	Excess running time moving out of parking stalls (s/veh)		0		
17	Tx_i	Total exiting running time (s/veh)		310		
18	Qa	Total emission rate from a parking ~~lot (g/m² · s)~~ garage ~~vent~~	9.89 g/s			
19	Qa'	Area source emission rate without the emissions from internal road segment. i				

* Assumes an entrance capacity consistent with a gate rate of 5 seconds per vehicle

** Cross Street capacity assuming a 4.5 s critical gap.

WORKSHEET 3 - AREA SOURCE EMISSIONS COMPUTATION

Area Source IP Parking Garage

Case # 3 Year 1990 Averaging Time 8 Hour

Step	Symbol	Input/Units	Traffic Stream			
1	Brt	Base running time	In	Out		
1.1		Base approach time(s)	0.7			
1.2		Base entrance time(s)	5			
1.3		Base movement-in time(s)	109			
1.4		Base stop, base start time(s)	10			
1.5		Base movement-out time(s)	93			
1.6		Base exit time(s)	10			
1.7		Base departure time(s)	0.7			
1.8		Total base running time(s)	228			
2	A	Area of parking lot (m^2)				
3	i	Entrance approach identification	In			
4	Ve_i	Entrance demand volume (vph)	110			
5	Ce_i	Entrance approach capacities (vph)	720			
6	i	Exit approach identification		Out		
7	Vx_i	Exit demand volume (vph)		110		
8	Cx_i	Exit approach capacities (vph)		453		
9		Number of parking spaces occupied				
10	F	Emissions	.109	.312		
11	Pc	Capacity of parking lot (veh)	800			
12	Rmi	Excess movement-in time(s)	0			
13	Fet	Facility emptying time(s)	8000			
14		Excess running time				
14.1	Ve_i/Ce_i	Entering volume-to-capacity ratio	.15			
14.2	Vx_i/Cx_i	Exiting volume-to-capacity ratio		.24		
14.3	Re_i	Excess running time entering parking lot	0.90			
14.4	Rx_i	Excess running time exiting parking lot		2.55		
15	Te_i	Total entering running time (s/veh)	115			
16	Rmo	Excess running time moving out of parking stalls (s/veh)		0		
17	Tx_i	Total exiting running time (s/veh)		117		
18	Qa	Total emission rate from a parking ~~lot ($g/m^2 - s$)~~ garage vent	1.50 g/s			
19	Qa'	Area source emission rate without the emissions from internal road segment. i				

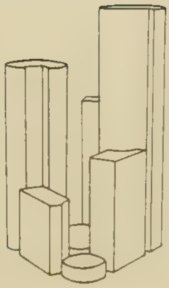
WORKSHEET 6 - CO AREA SOURCE DISPERSION ANALYSIS

Area Source Existing Parking Lot

Case # 1 Year 1984 Averaging Time 1 Hour

Step	Symbol	Input/Units				
		Basic Inputs	Traffic Stream			
			Case 1	Case 1	Case 2	Case 2
1		Source ID	1-Hr	8-Hr	1-Hr	8-Hr
2	SC	Stability class	D	D	D	D
3	U	Wind speed (m s^{-1})	1.0	1.6	1.0	1.6
4	σ_{z_0}	Initial dispersion (m)	5.0	5.0	5.0	5.0
5	x_0	Virtual dispersion distance (m)	19.9	19.9	19.9	19.9
6	x_u	Actual upwind distance (m)	41.1	41.1	41.1	41.1
7	$r_u=x_u+x_0$	Effective upwind distance (m)	61.0	61.0	61.0	61.0
8	x_d	Actual downwind distance (m)	1.0	1.0	1.0	1.0
9	$r_d=x_d+x_0$	Effective downwind distance (m)	20.9	20.9	20.9	20.9
10	Qa	Emission rate (g m^{-2} s^{-1})	.00114	.000235	.000775	.000154
		Dispersion Computation				
11	$(XU/Qa)_u$	Upwind normalized concentration	17,000	17,000	17,000	17,000
12	$(XU/Qa)_d$	Downwind normalized concentration	- 13,500	- 13,500	- 13,500	- 13,500
13	XU/Qa	Normalized CO concentration	3,500	3,500	3,500	3,500
14	Qa	Emission rate (g m^{-2} s^{-1})	x .00114	x .000235	x .000775	x .000154
15	XU		4.0	0.8	2.7	0.5
		Enter Line 3	÷ 1.0	÷ 1.6	÷ 1.0	÷ 1.6
16	X	CO concentration (mg m^{-3})	4.0	0.5	2.7	0.3
17	X	CO concentration (ppm)	3.5	0.4	2.3	0.3

Pedestrian Wind Analysis



APPENDIX B

EXPERIMENTAL MEASUREMENTS

Figure B1 Approach and Site Velocity Profiles for Approach A

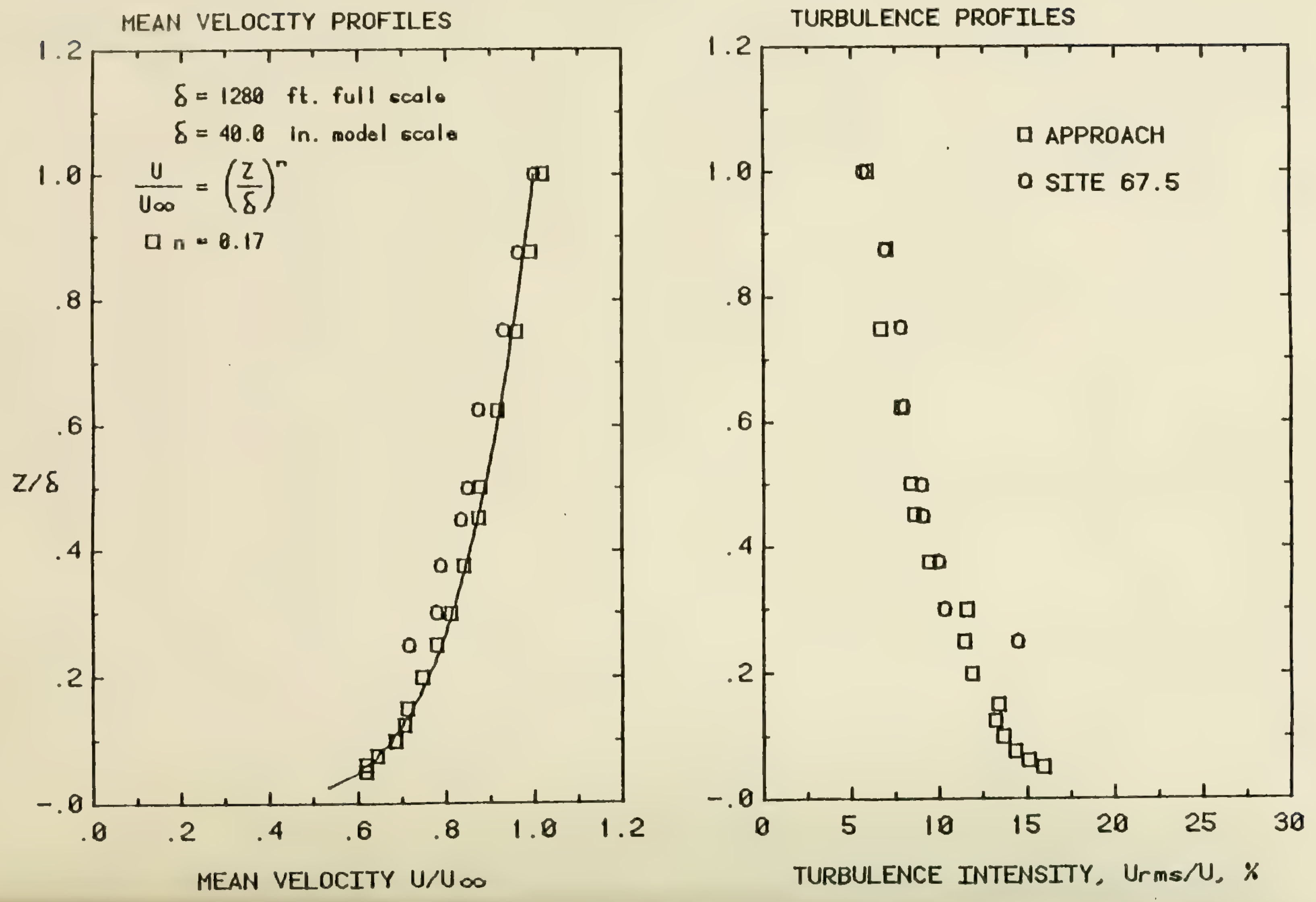


Figure B2 Approach and Site Velocity Profiles for Approach B

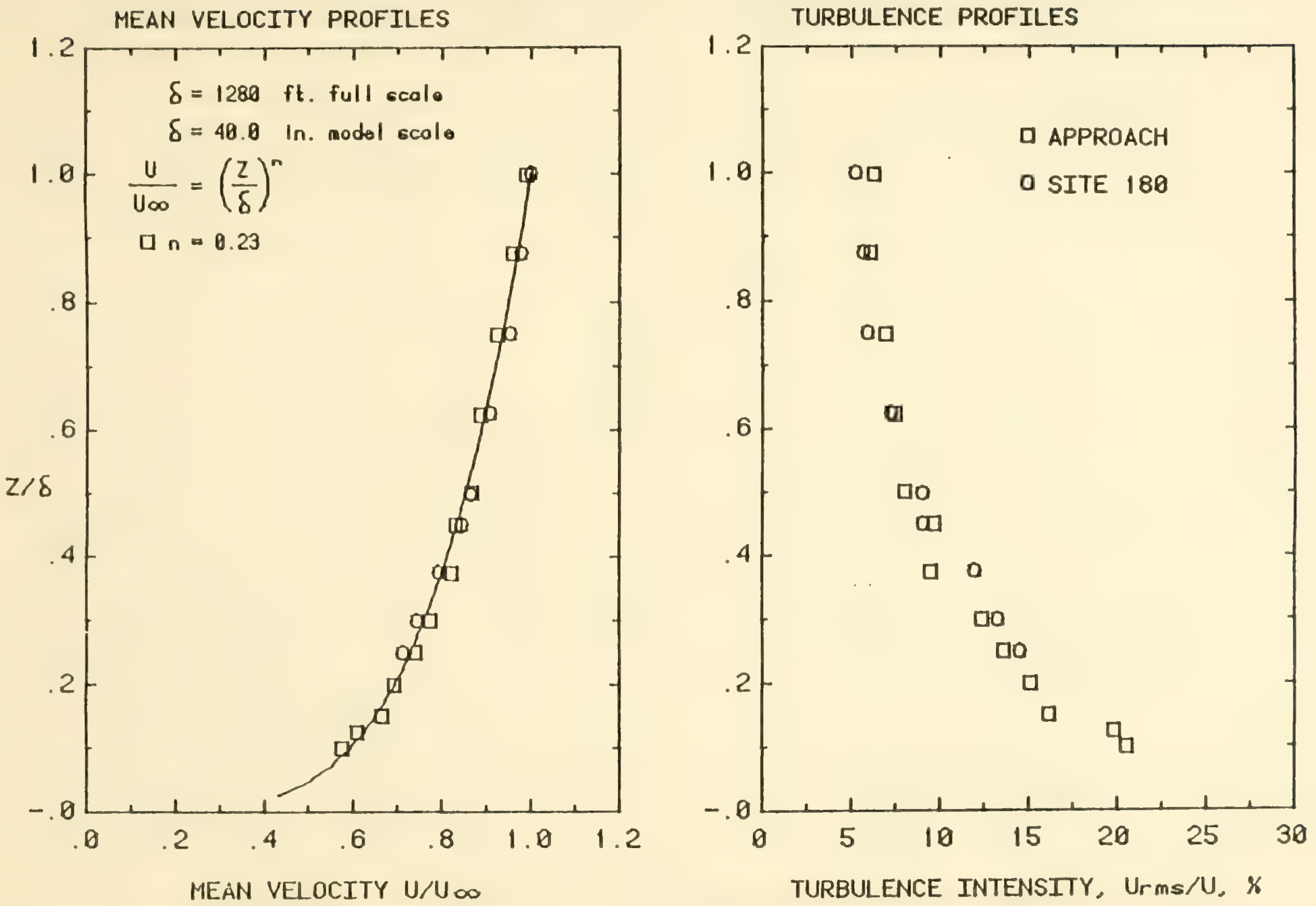
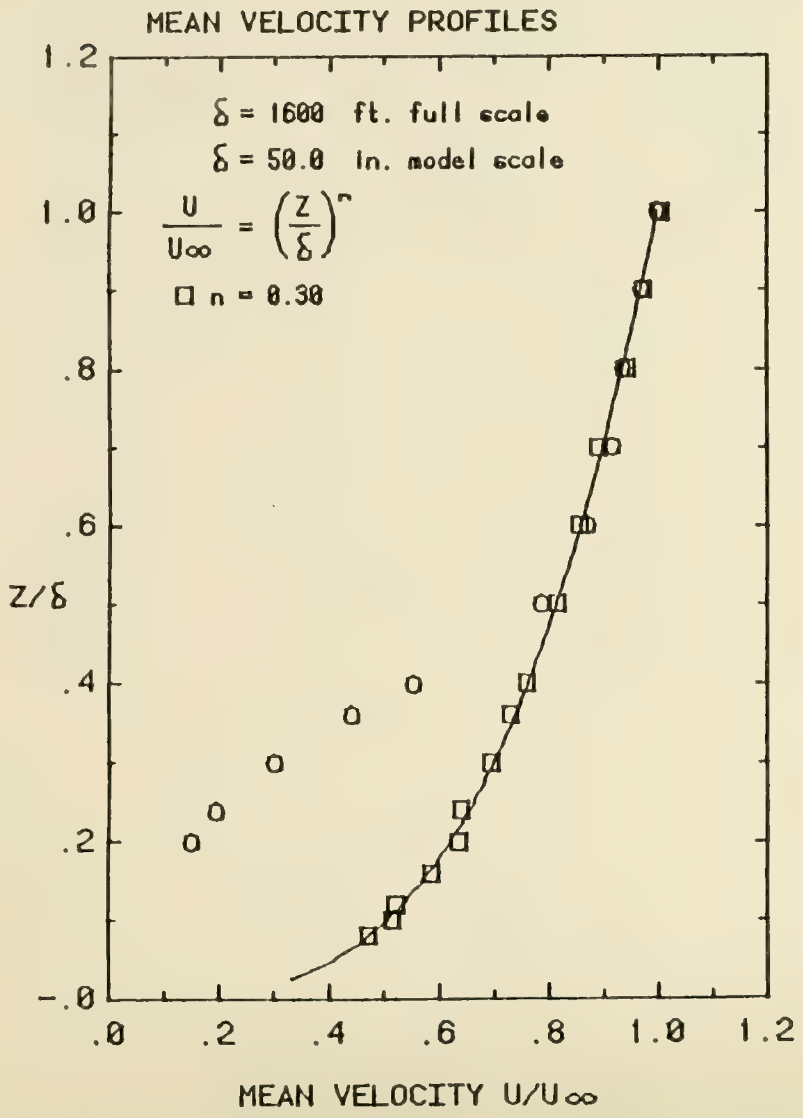
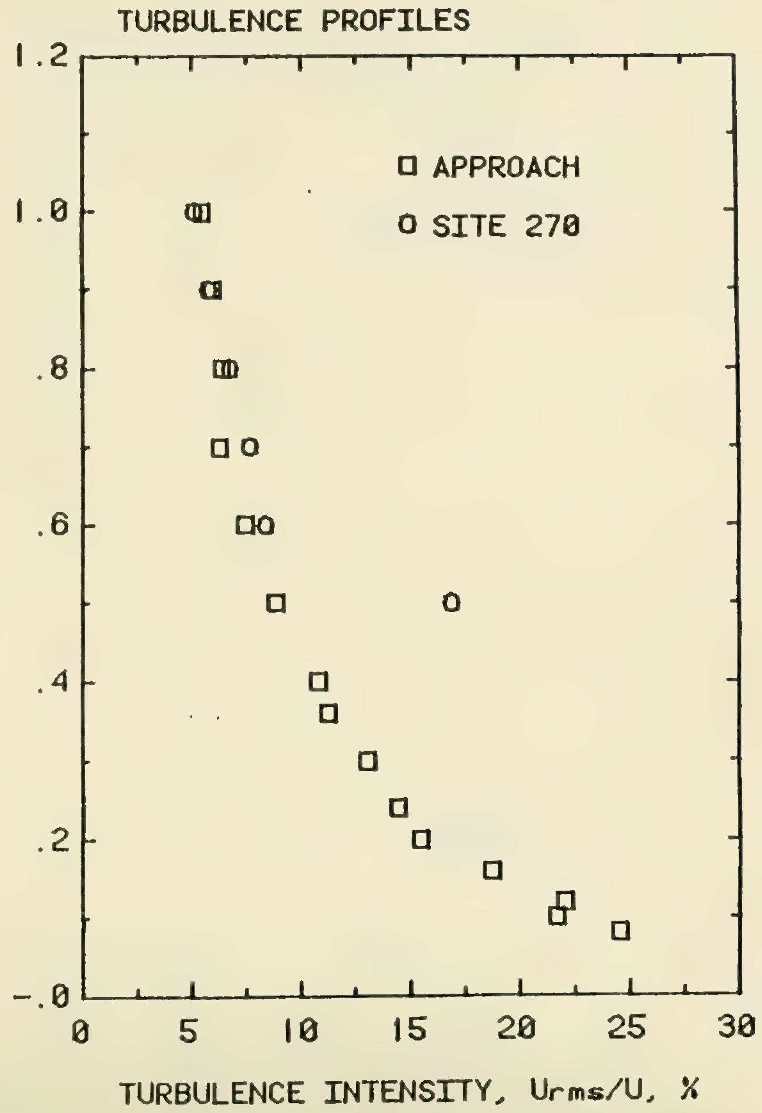


Figure B3 Approach and Site Velocity Profiles for Approach C





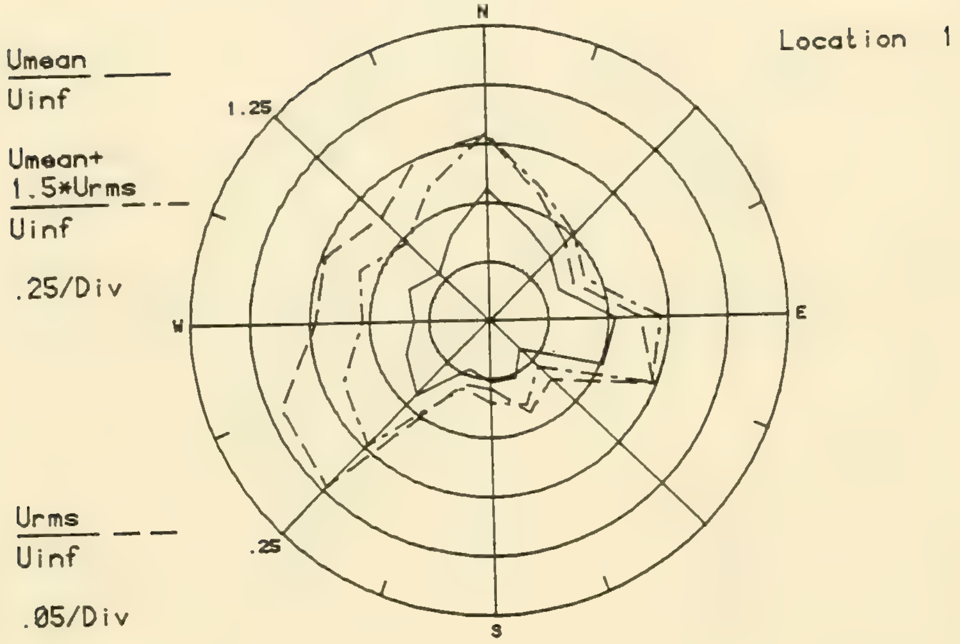
APPENDIX C

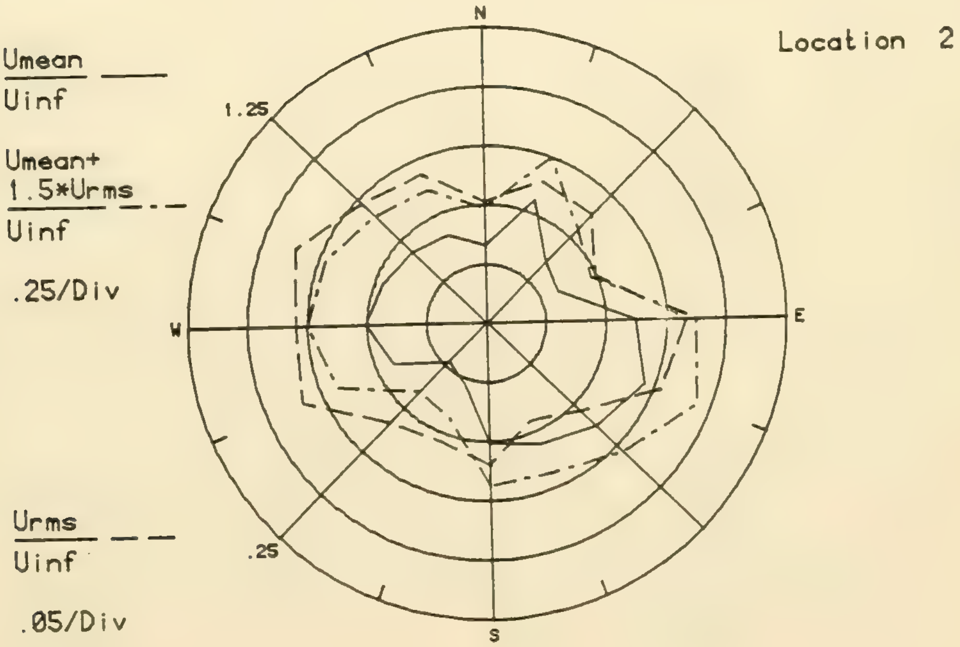
POLAR PLOTS OF PEDESTRIAN WINDS

POLAR PLOTS OF PEDESTRIAN WINDS

The graphs included in this appendix show the directional variation of measured wind speeds normalized by the wind speed at an elevation of 900 feet.

Configuration PRE





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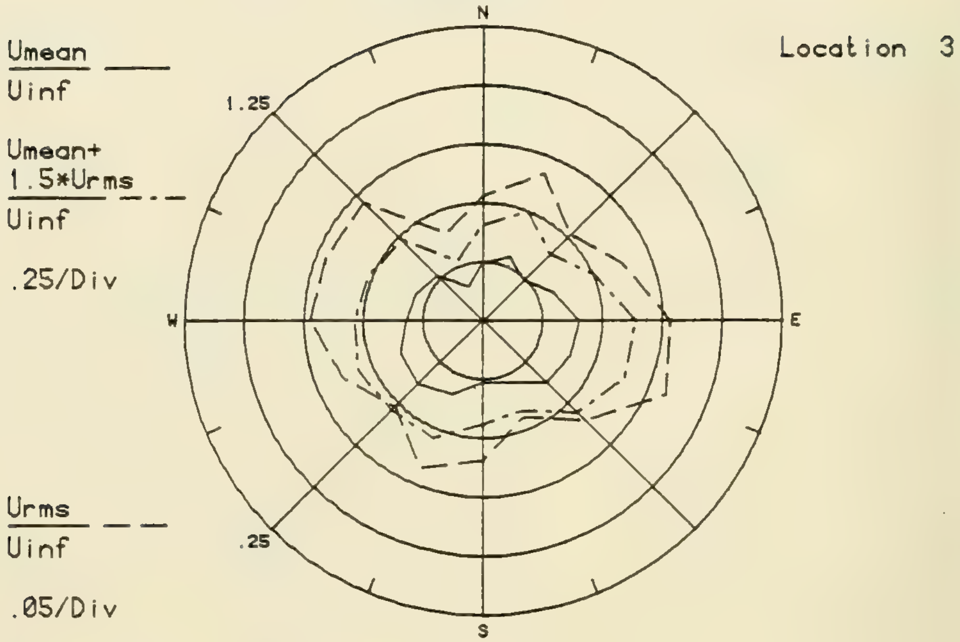

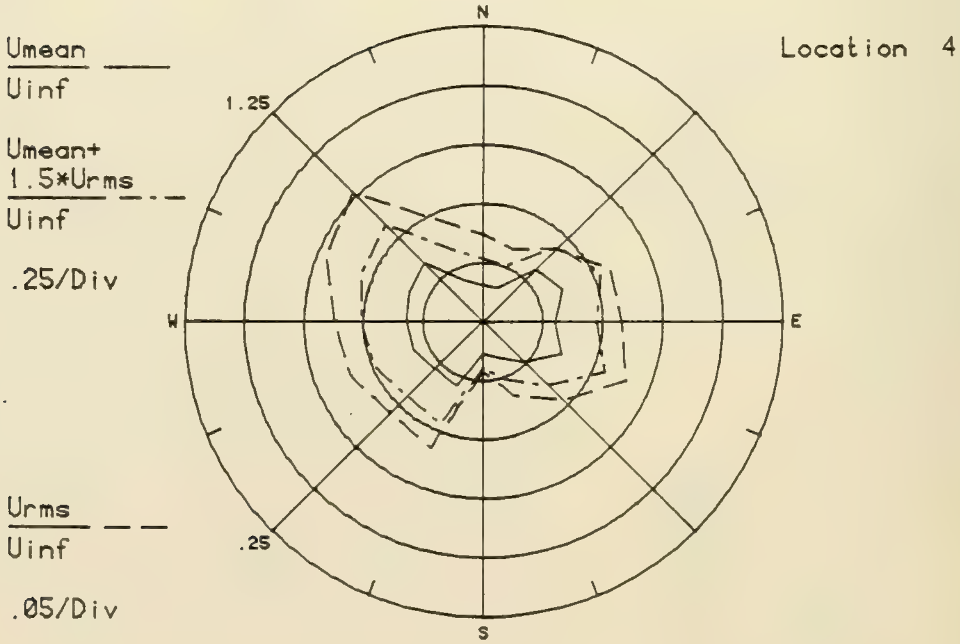

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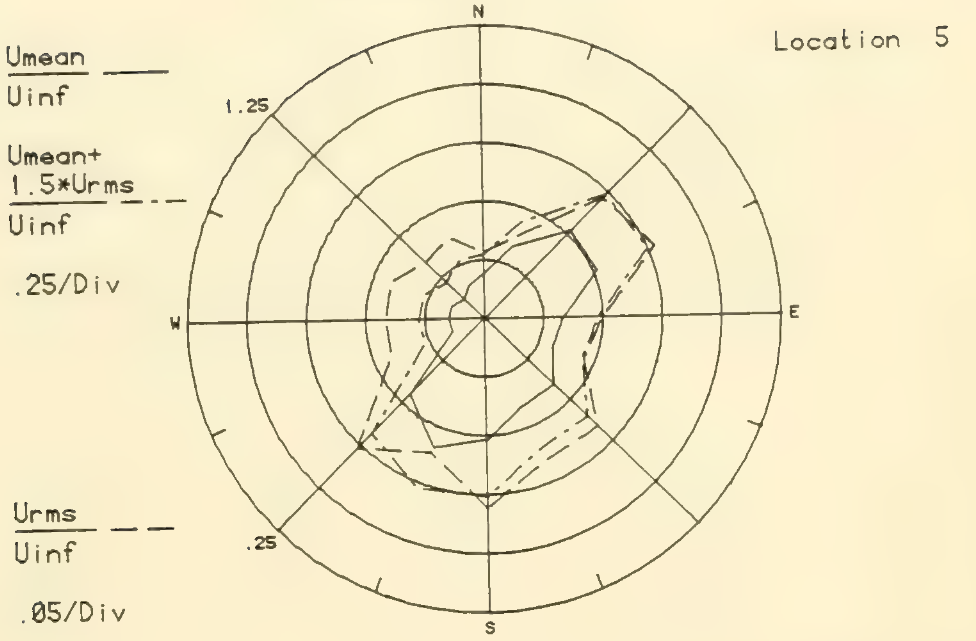

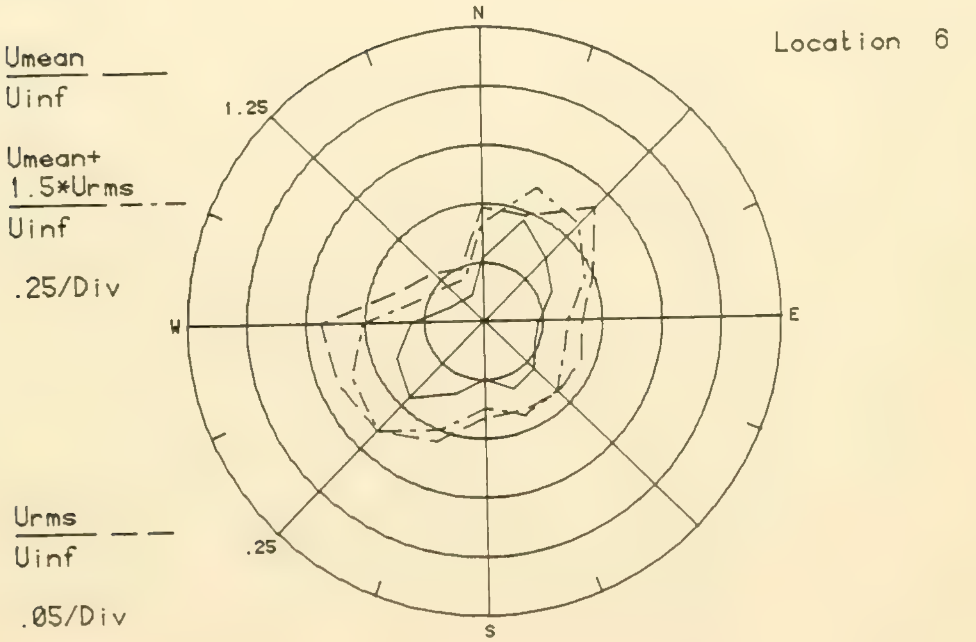

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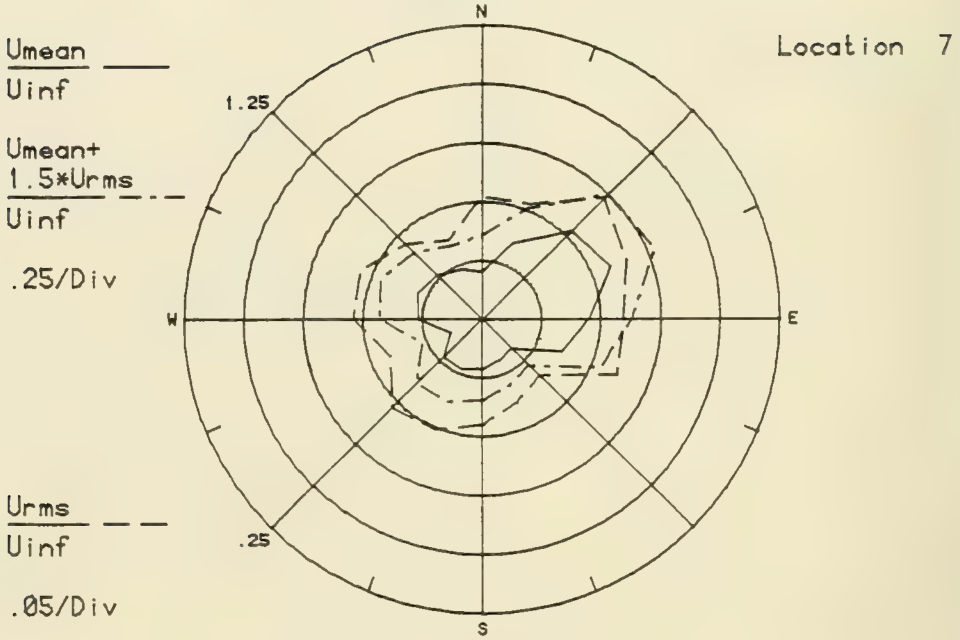

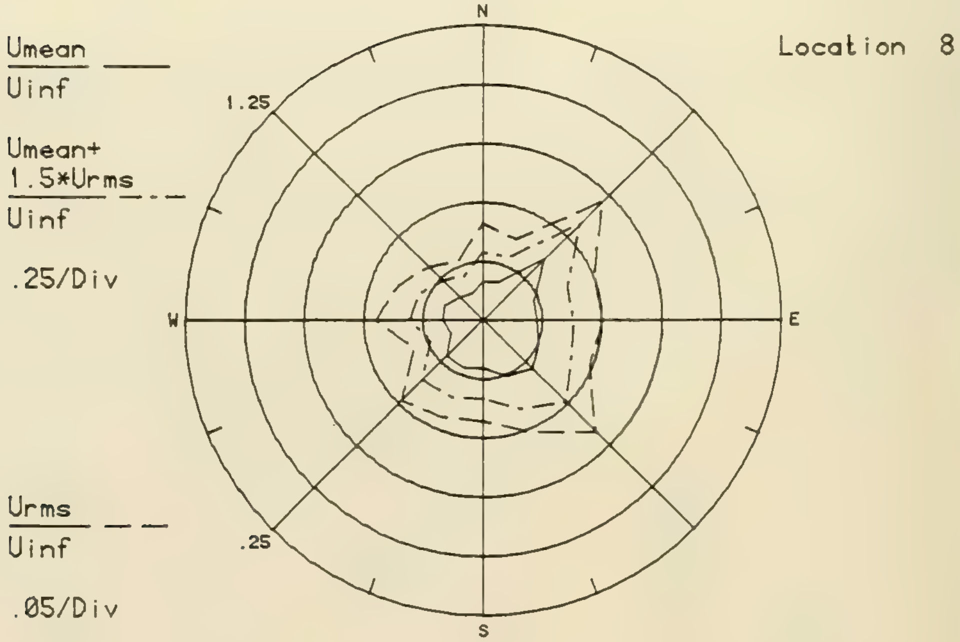

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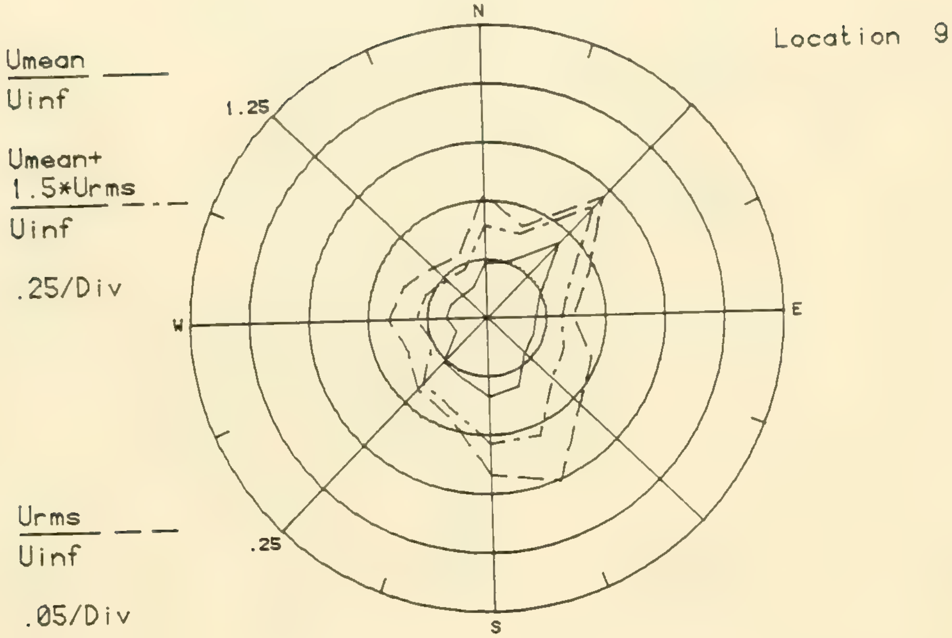
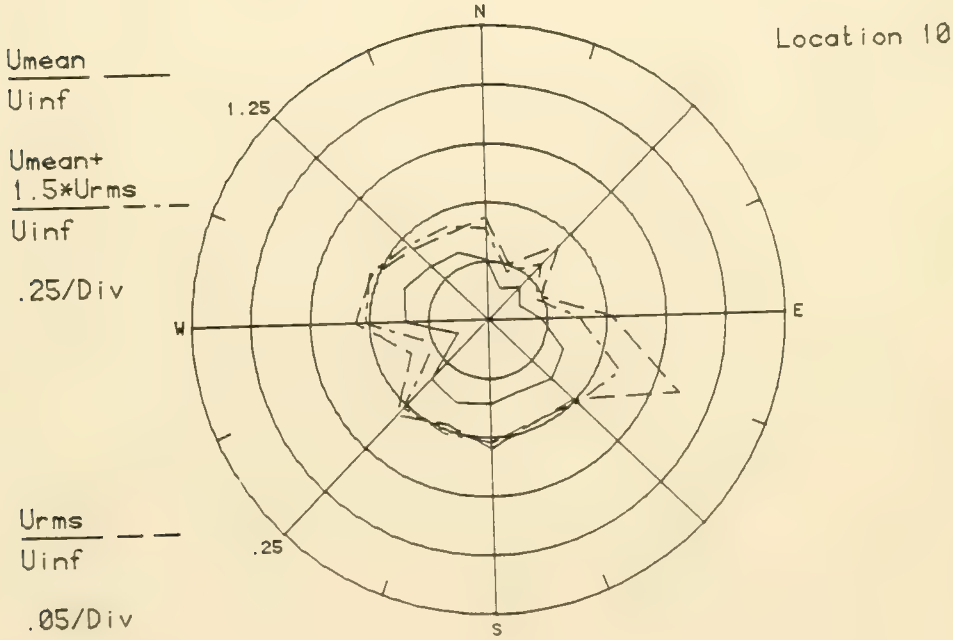




Configuration PRE

Location 11

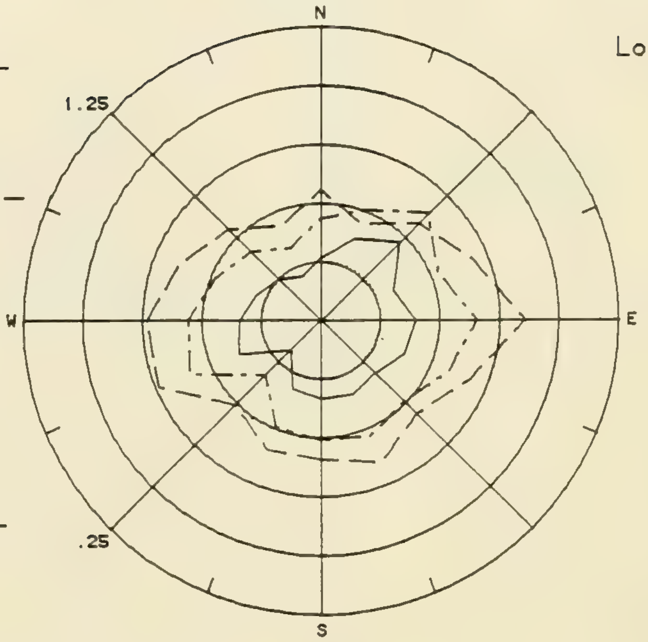
Umean / Uinf ———

Umean+ 1.5*Urms / Uinf — · —

.25/Div

Urms / Uinf — —

.05/Div



Location 12

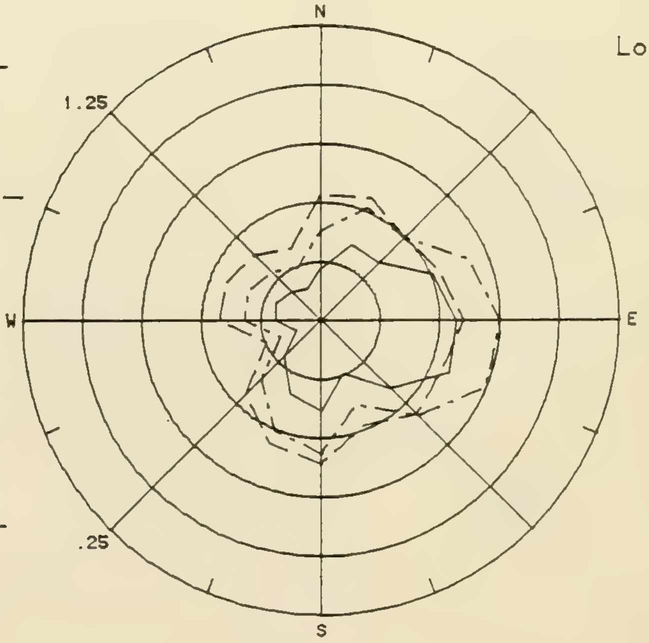
Umean / Uinf ———

Umean+ 1.5*Urms / Uinf — · —

.25/Div

Urms / Uinf — —

.05/Div



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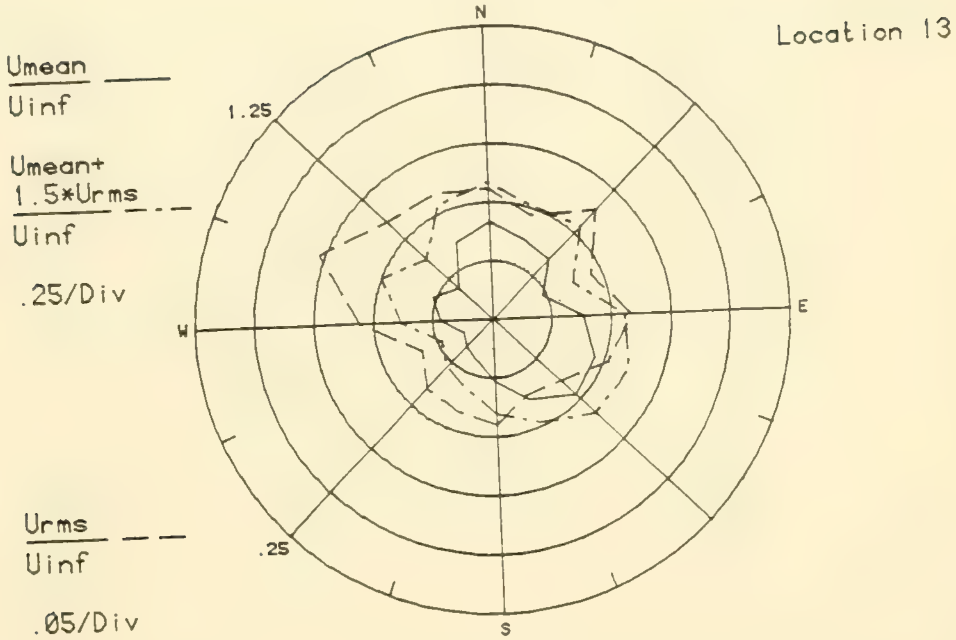

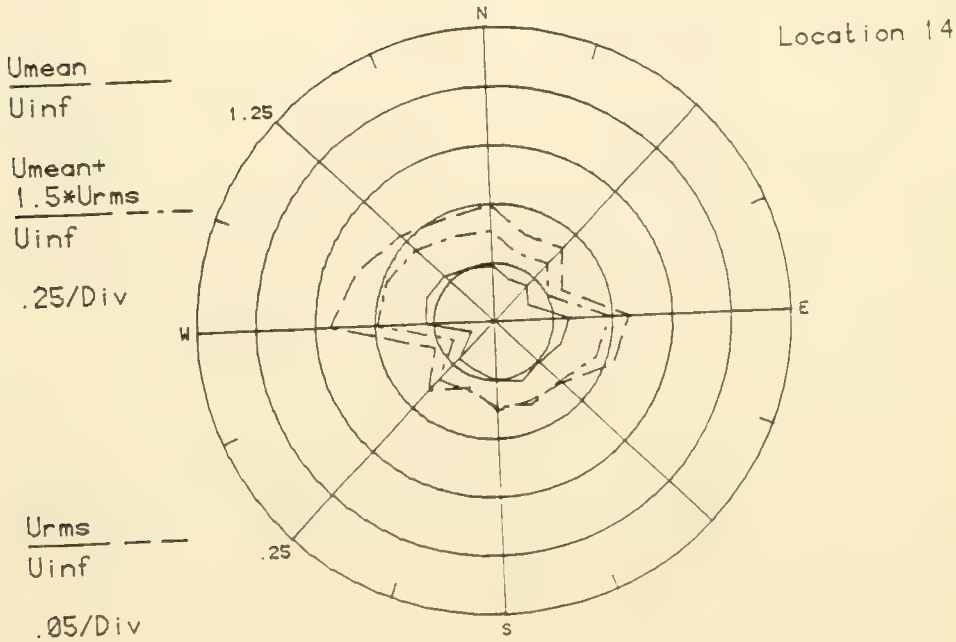

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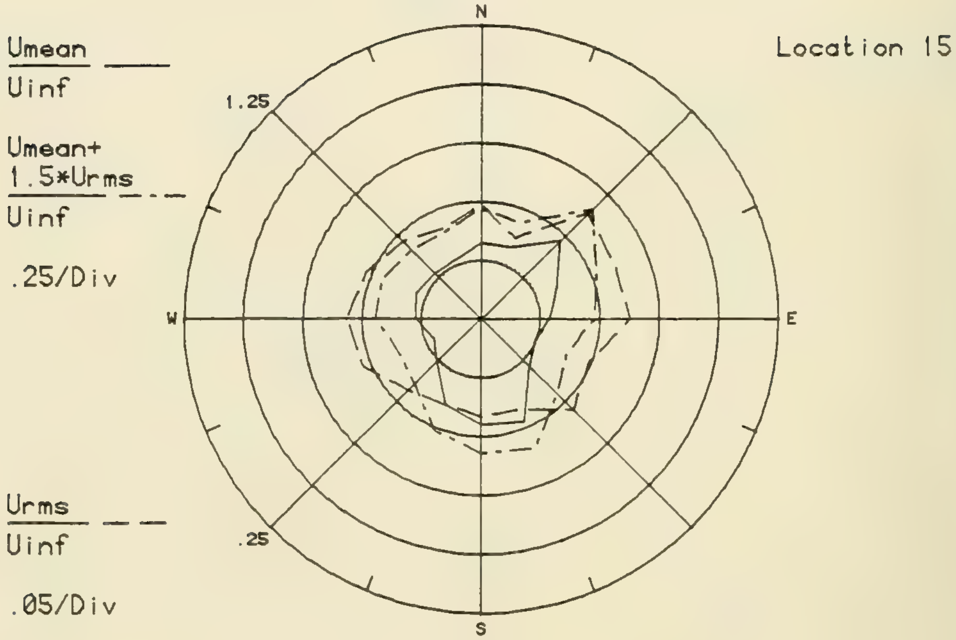

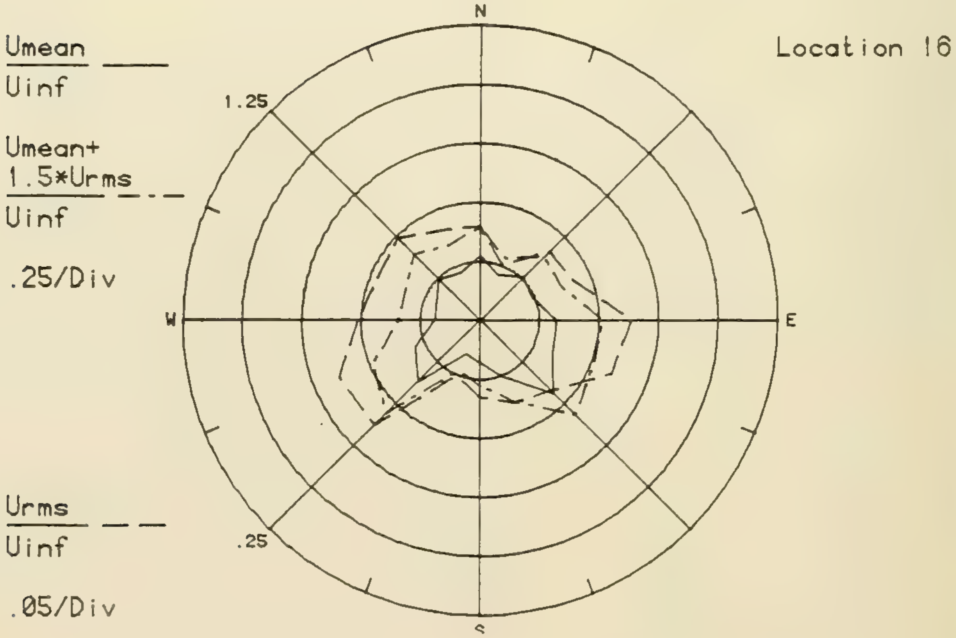

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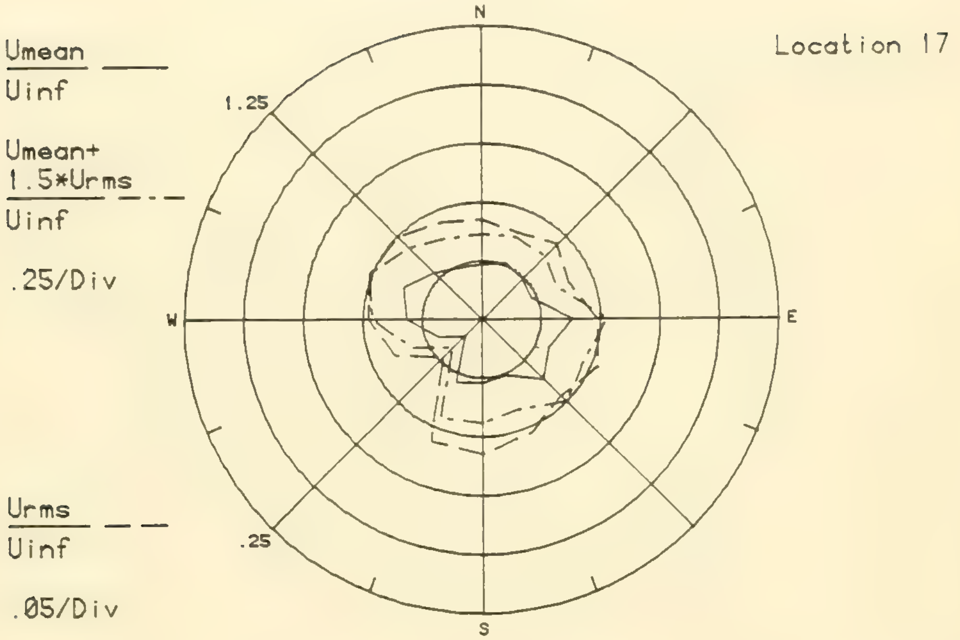

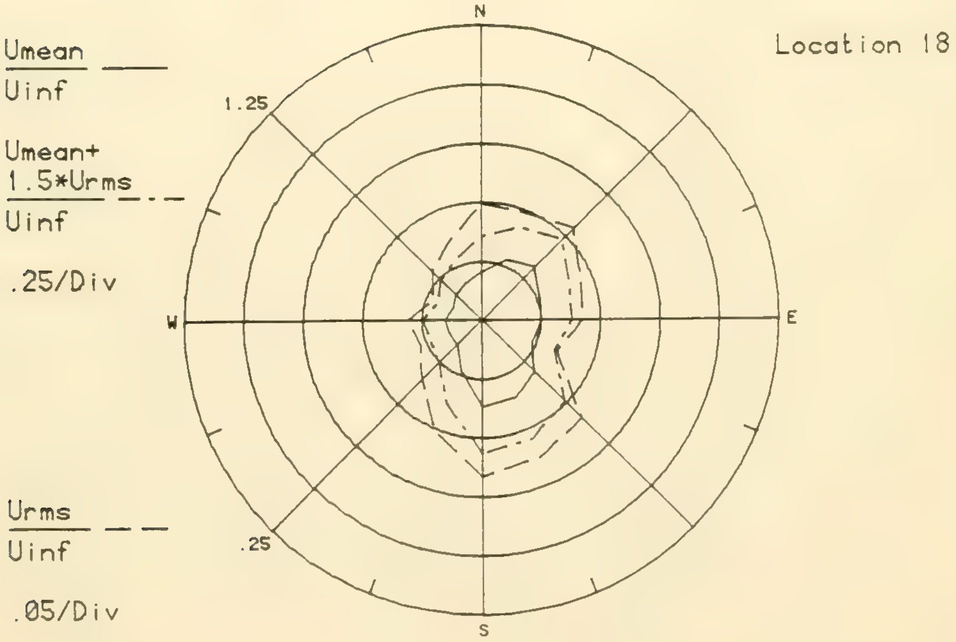

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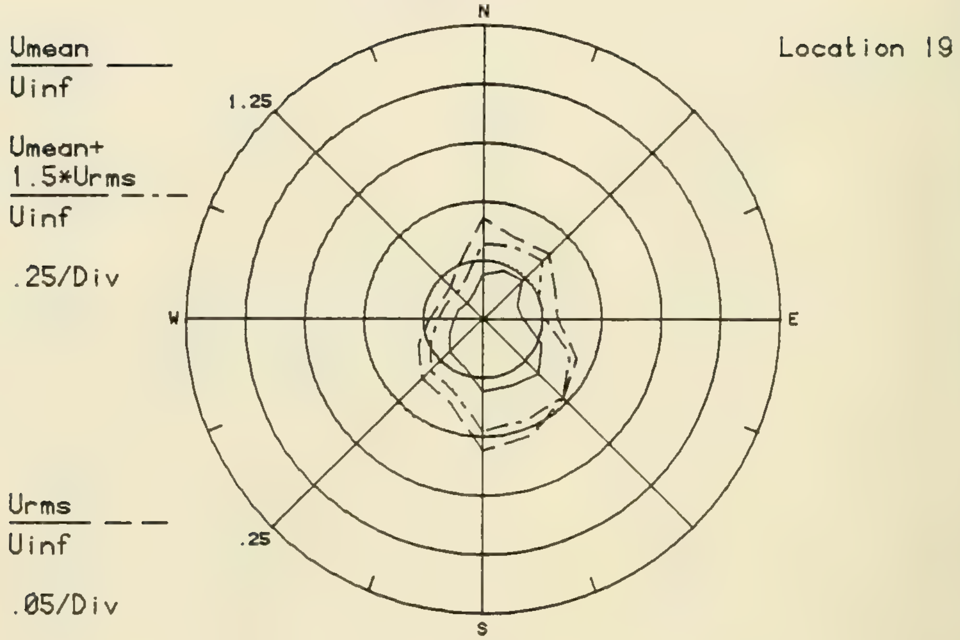

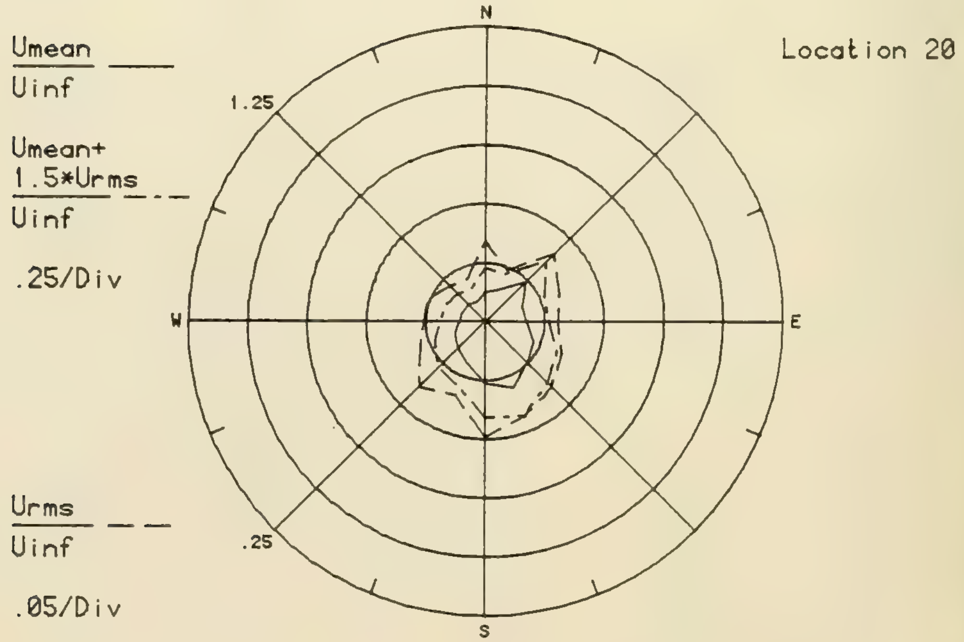

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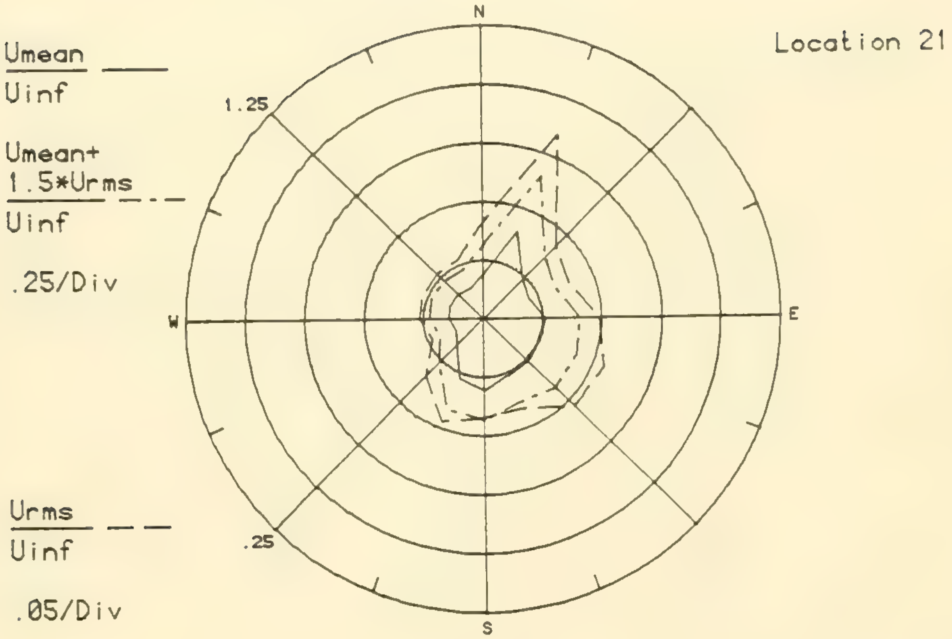
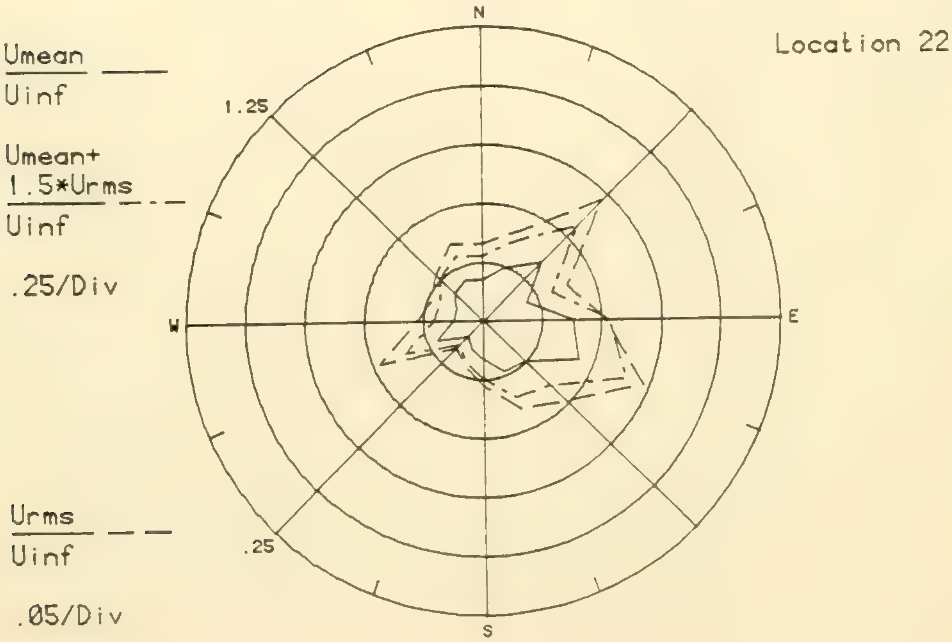




Configuration PRE

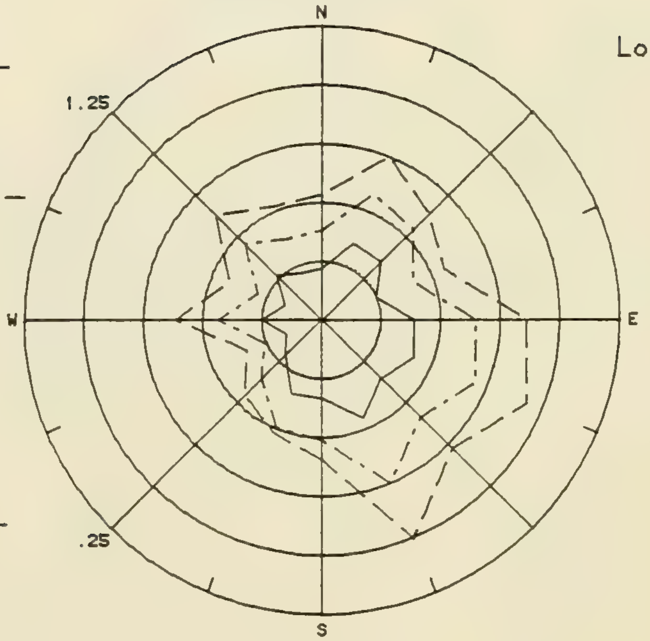
Umean / Uinf ———

Umean+ 1.5*Urms / Uinf — · —

.25/Div

Urms / Uinf — —

.05/Div



Location 23

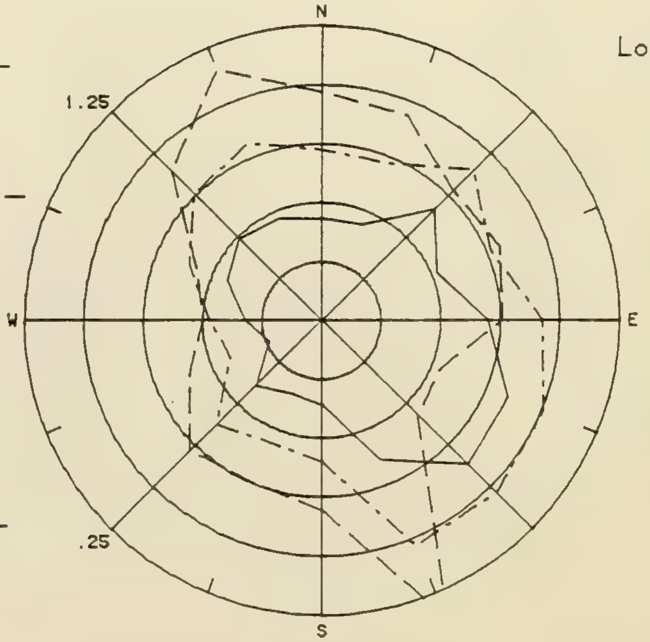
Umean / Uinf ———

Umean+ 1.5*Urms / Uinf — · —

.25/Div

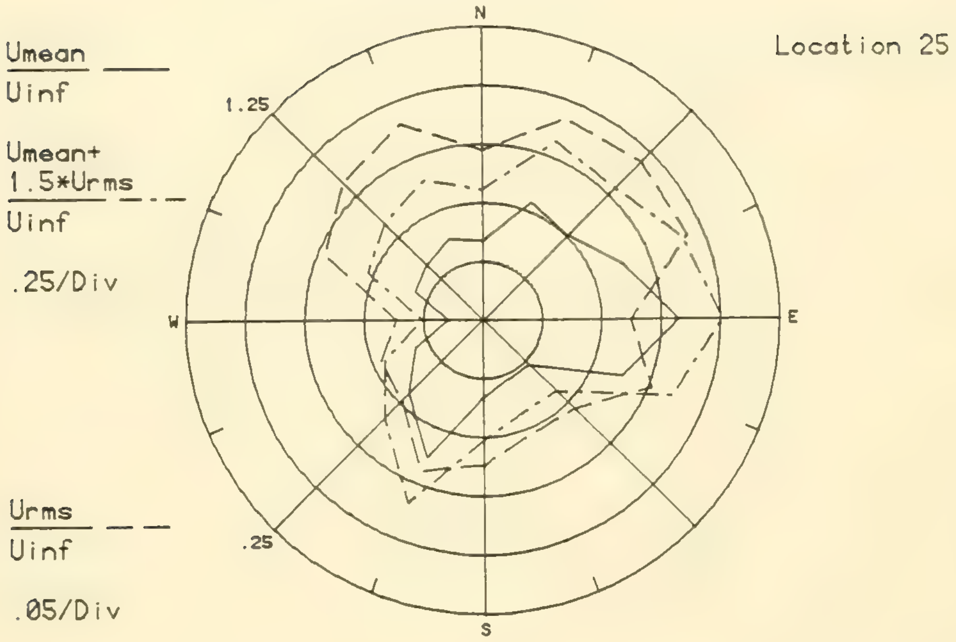
Urms / Uinf — —

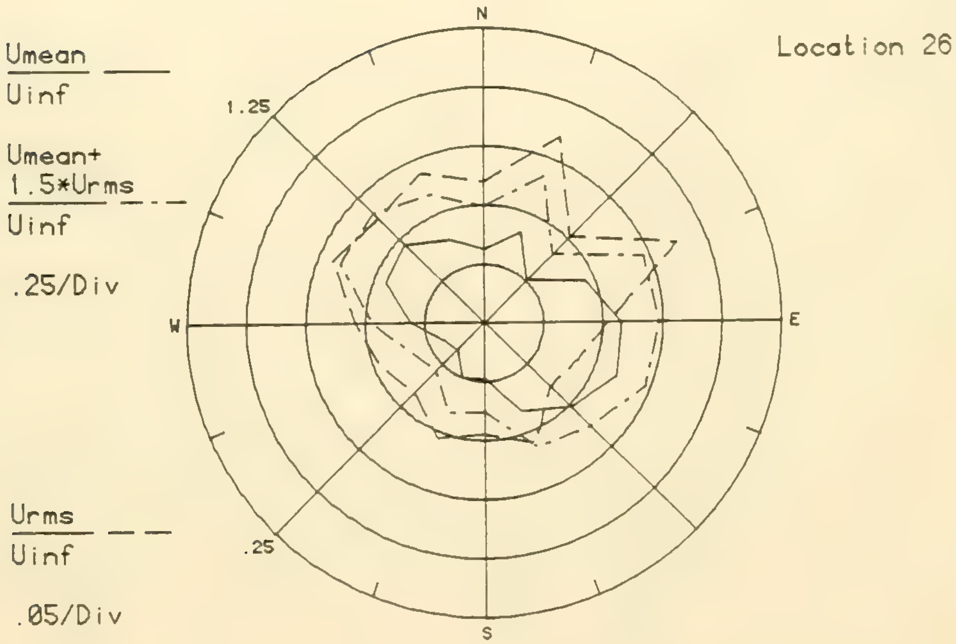
.05/Div



Location 24

Configuration PRE





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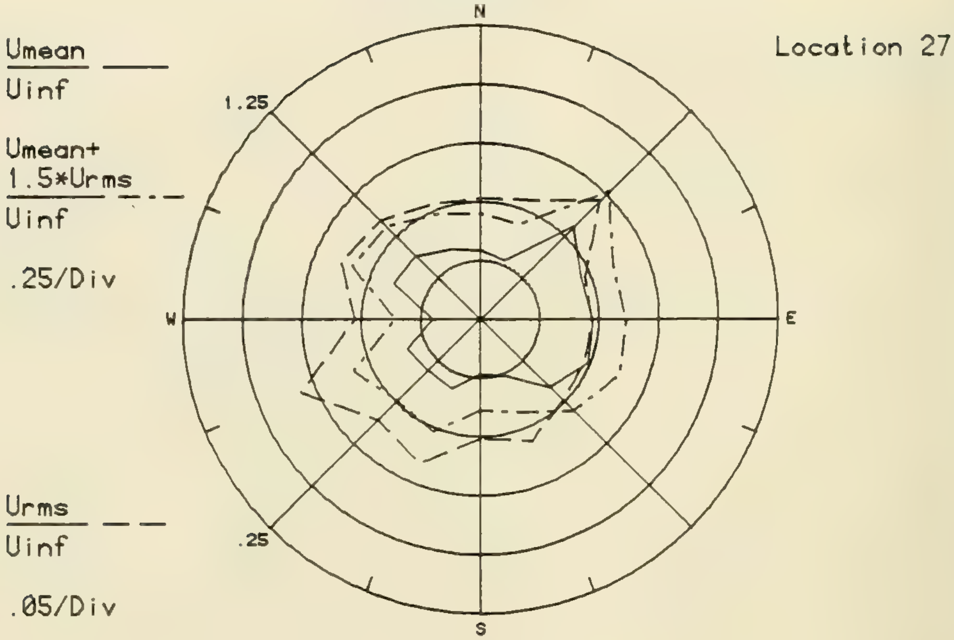

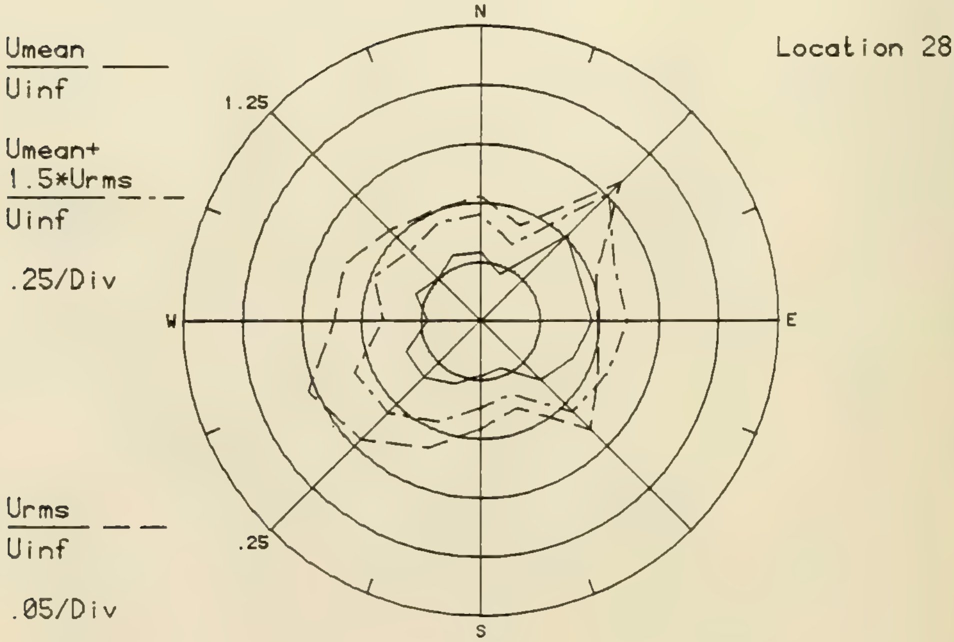

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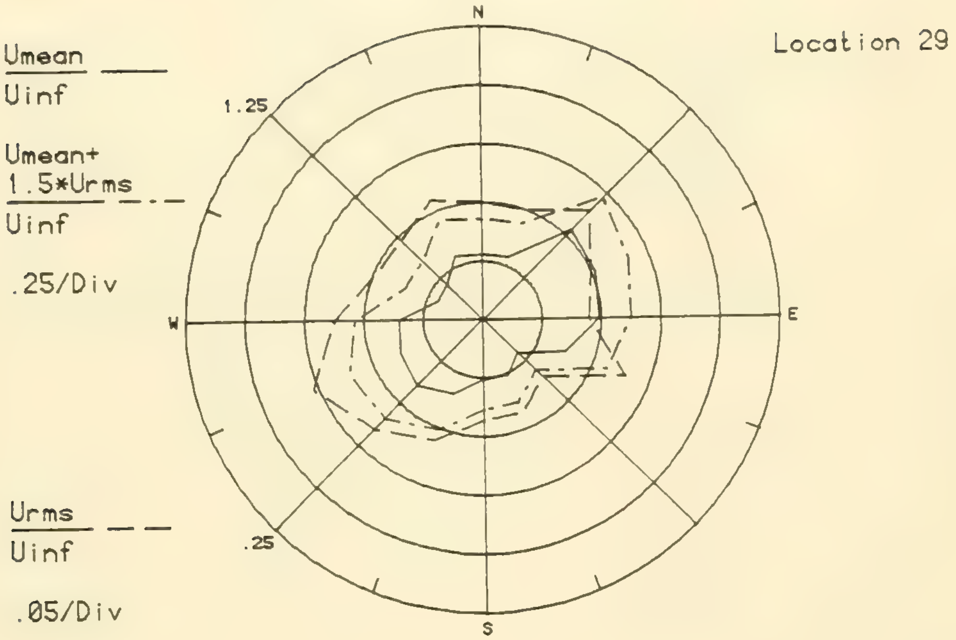

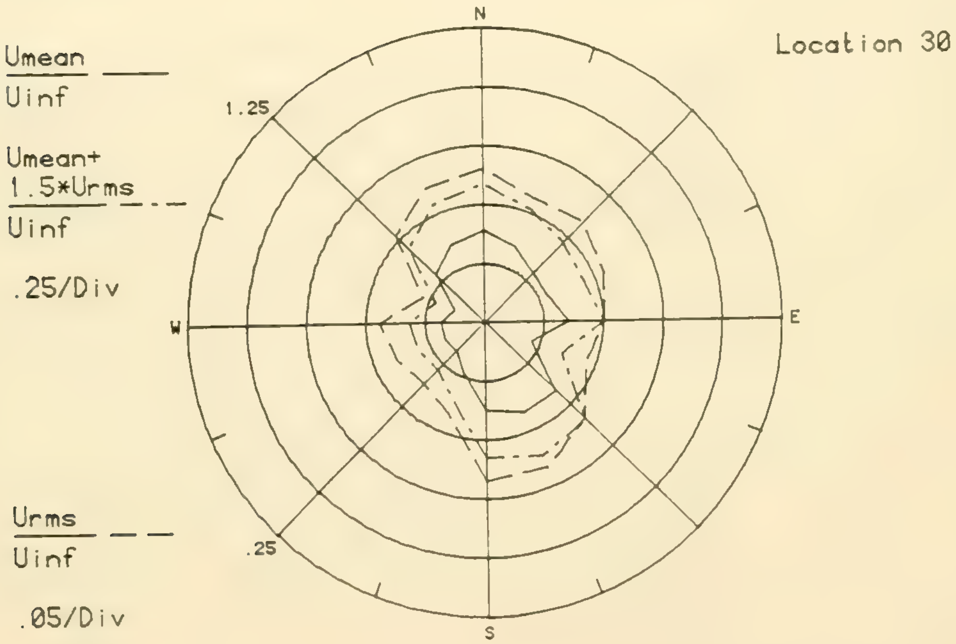

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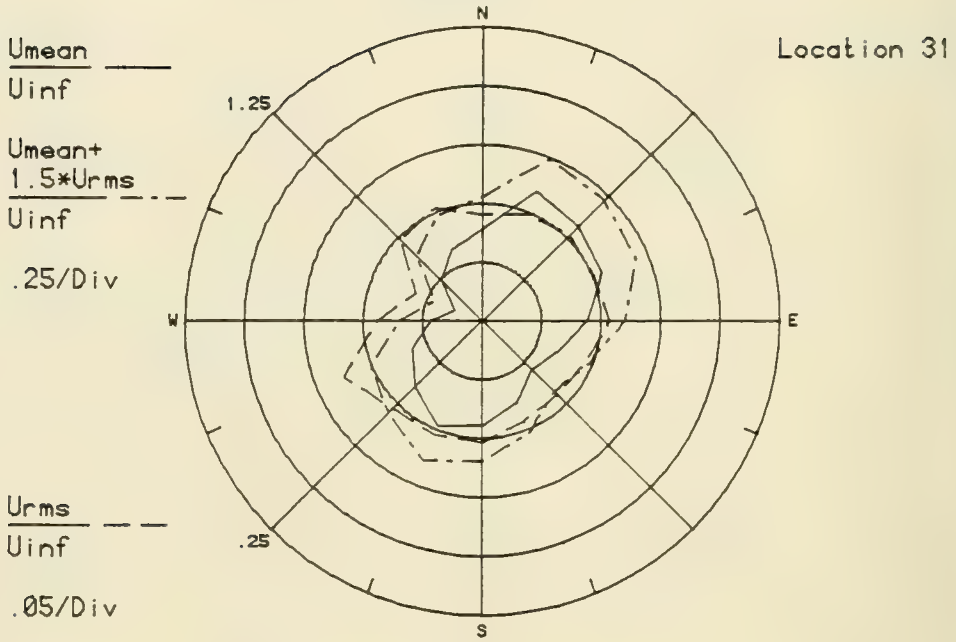

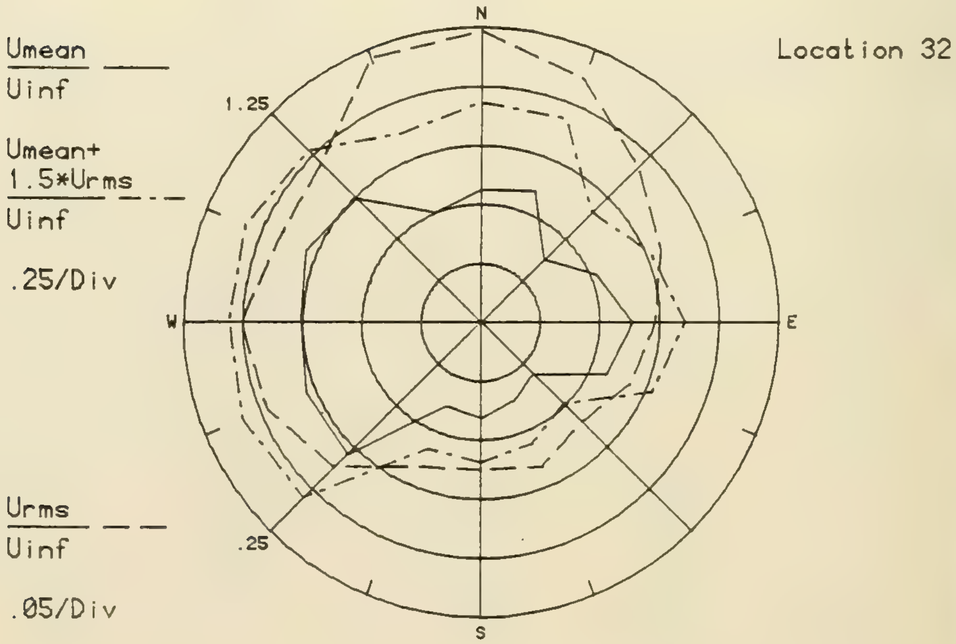

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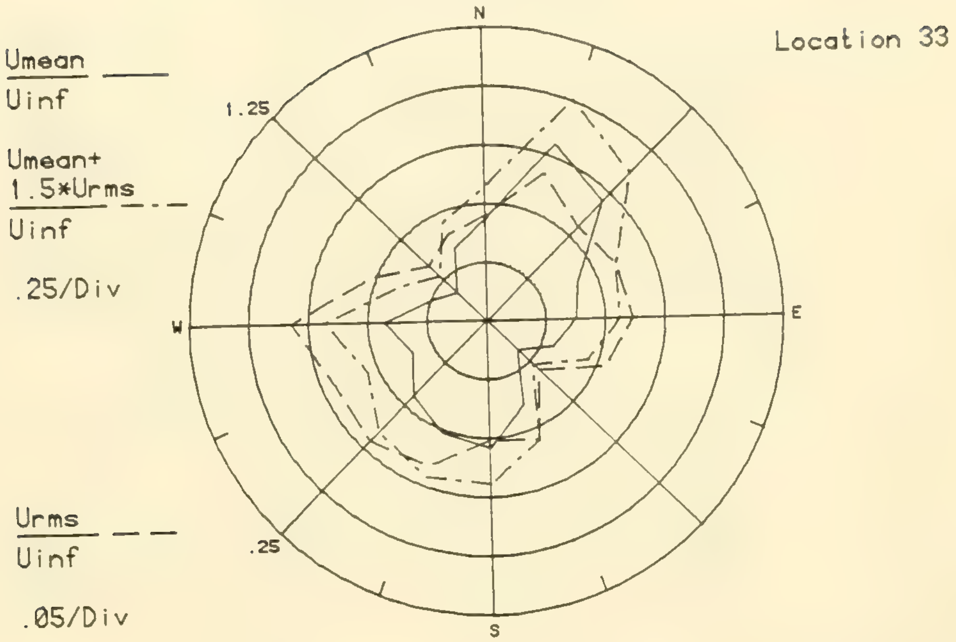

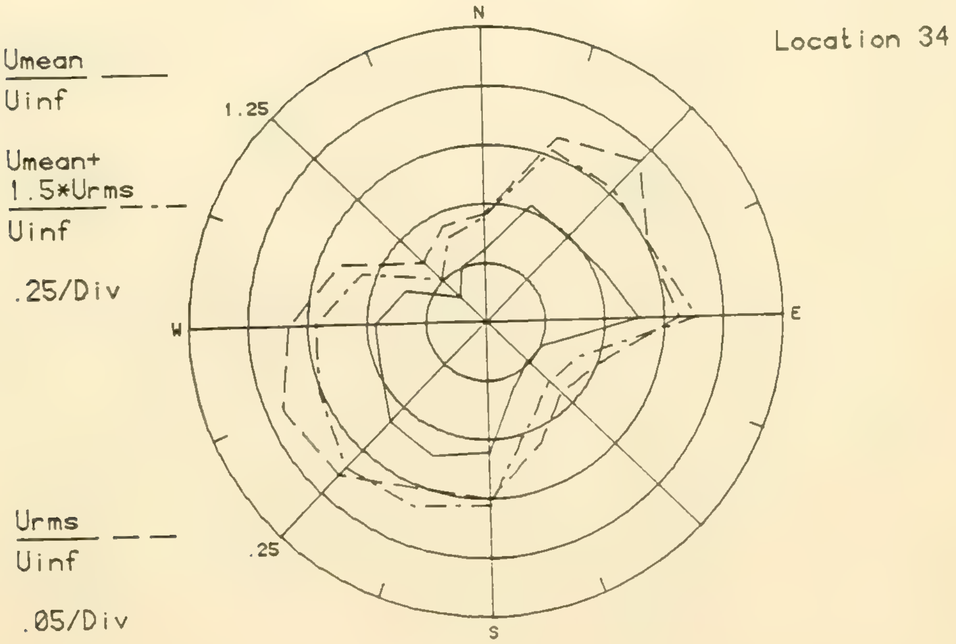

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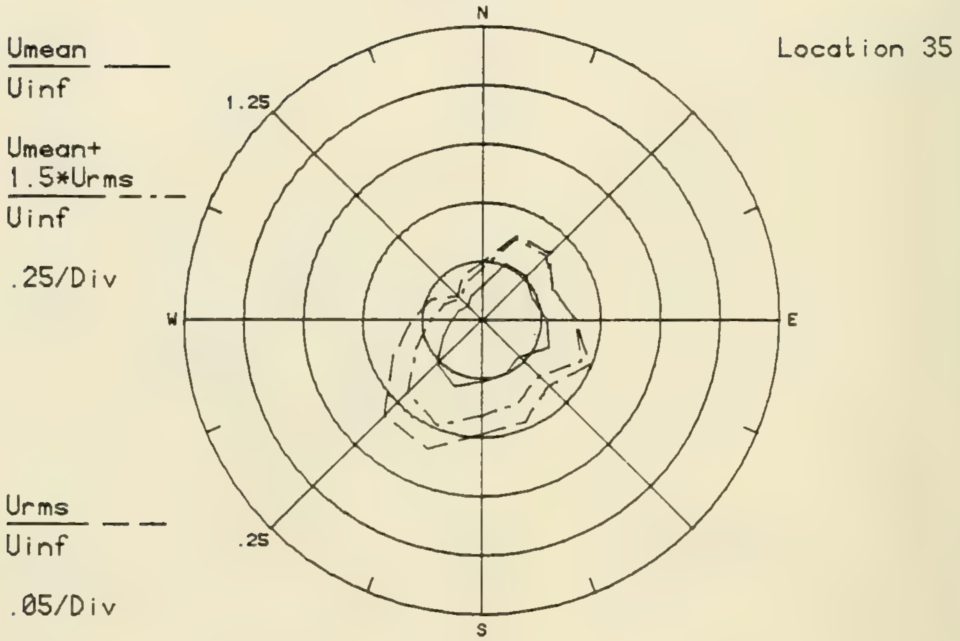

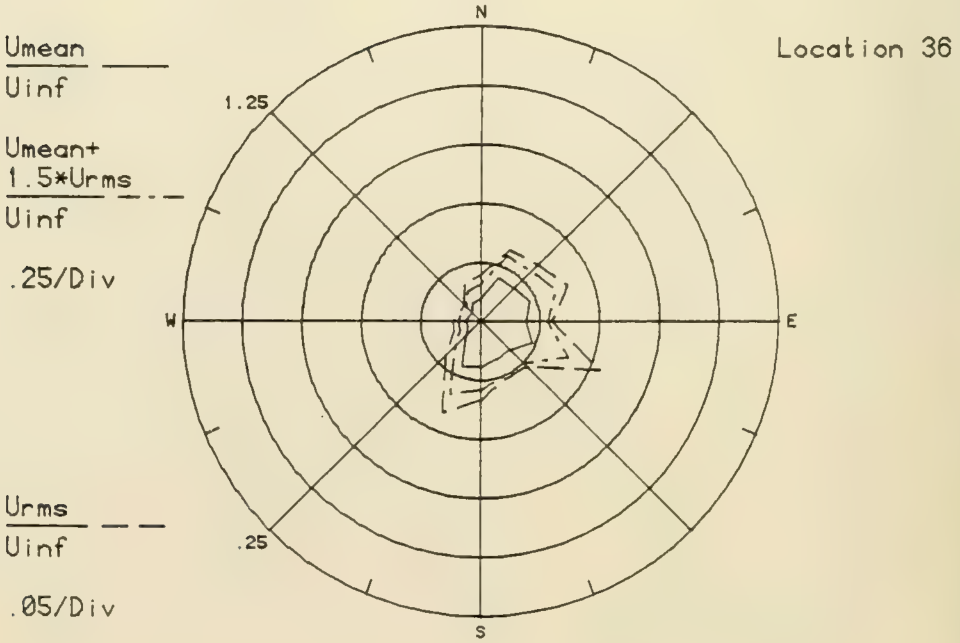

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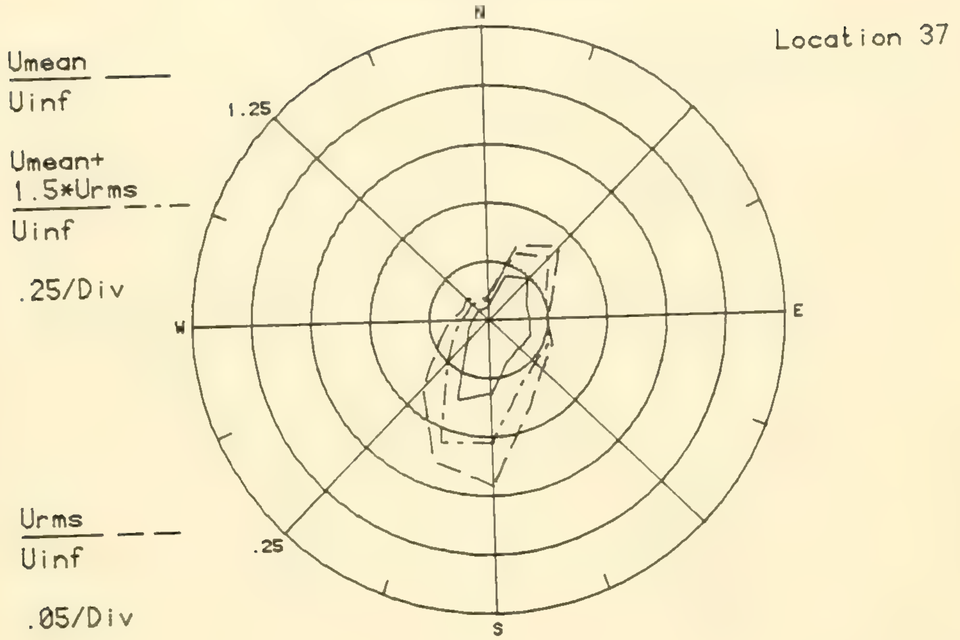

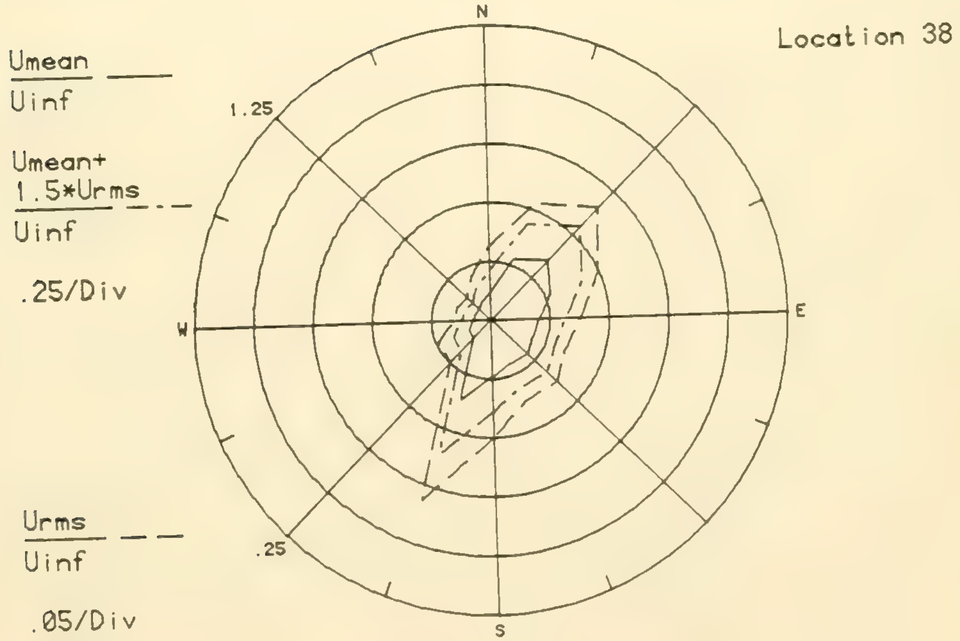

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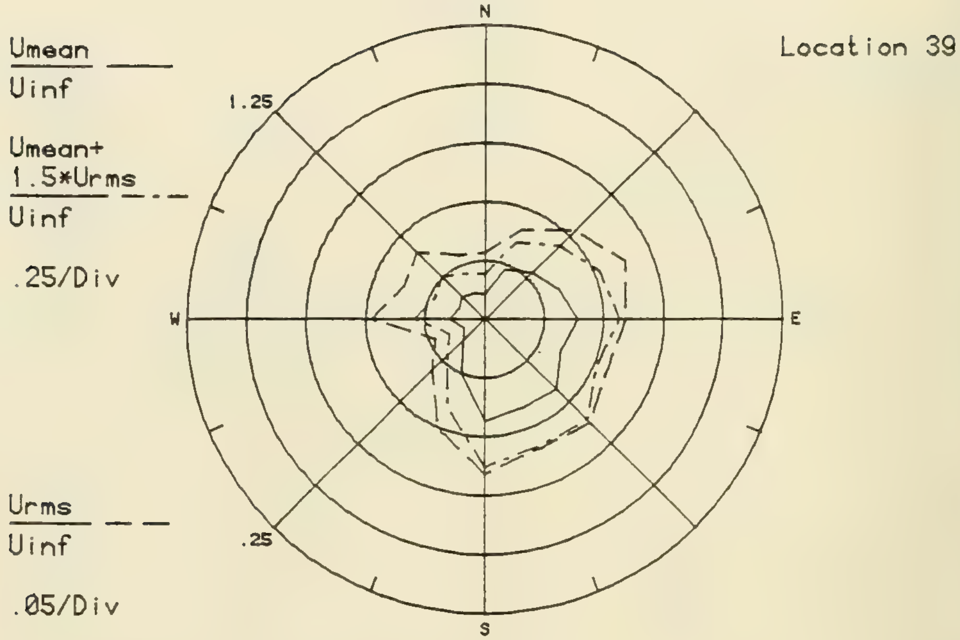

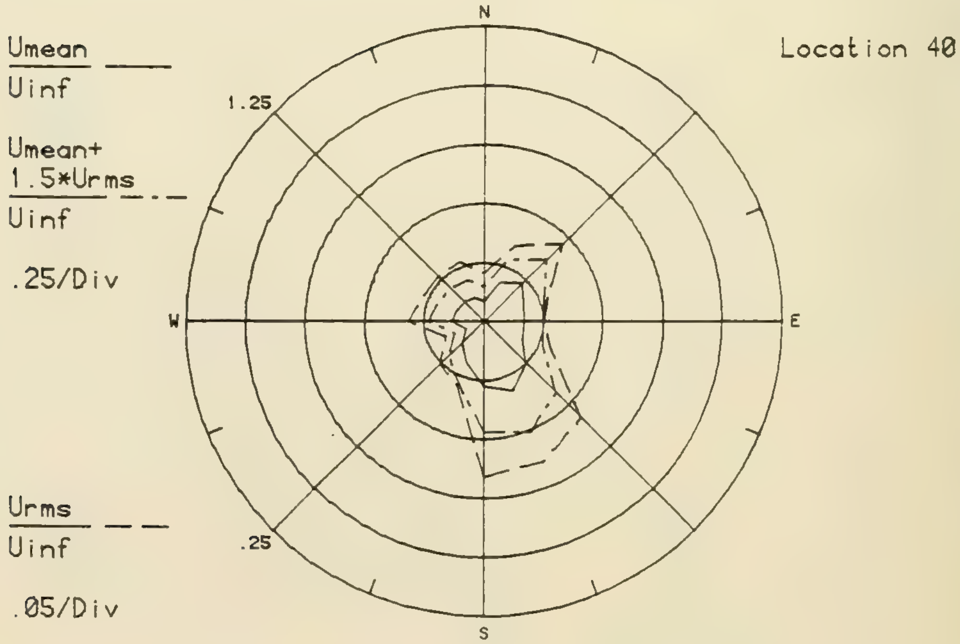

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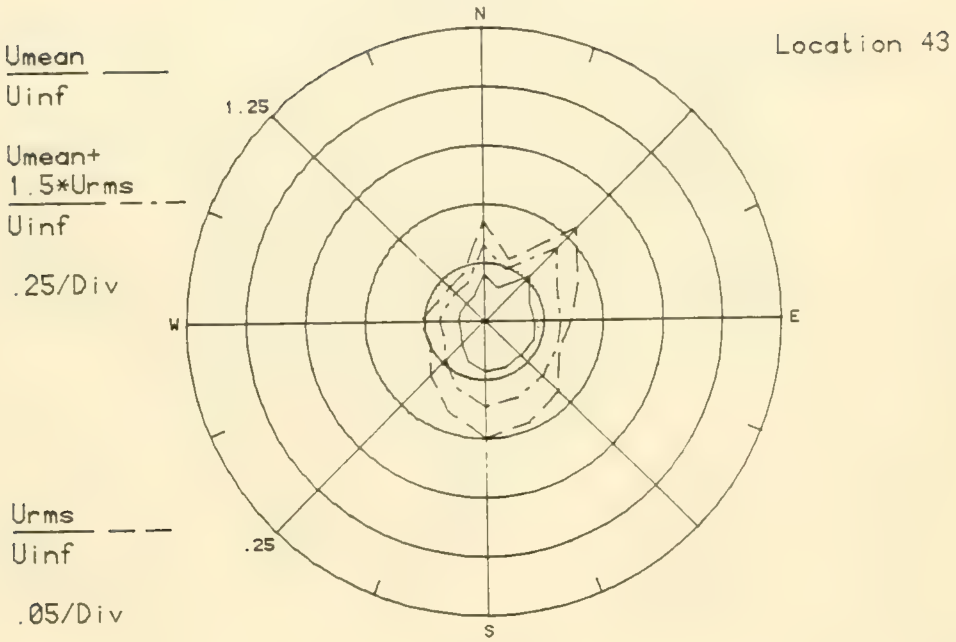

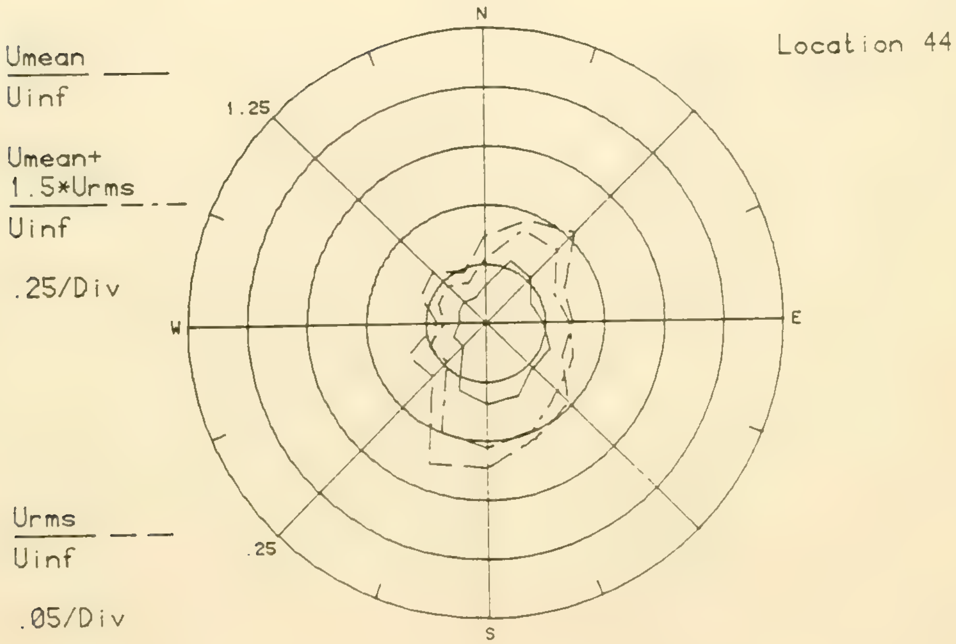

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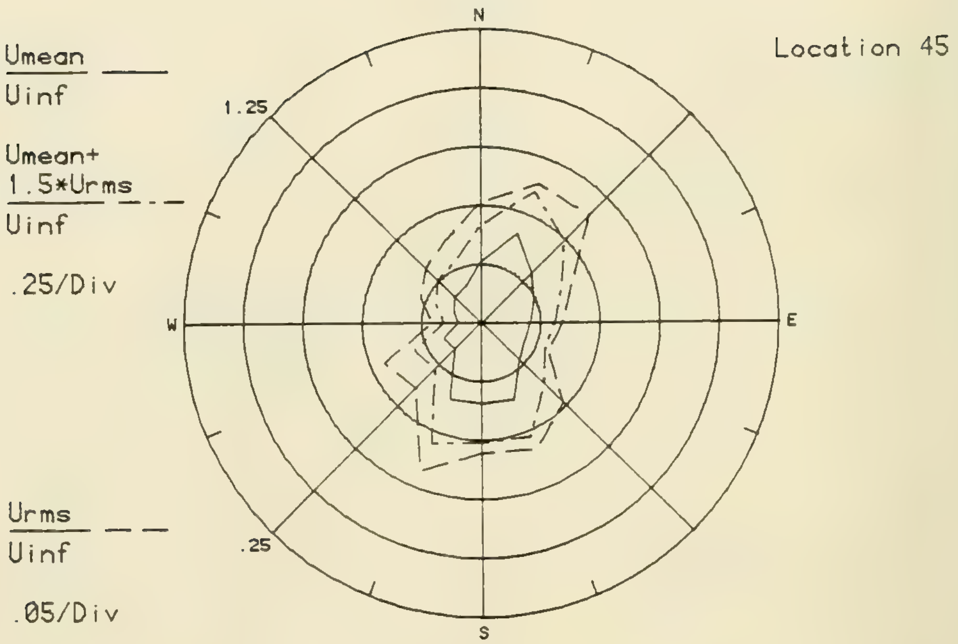

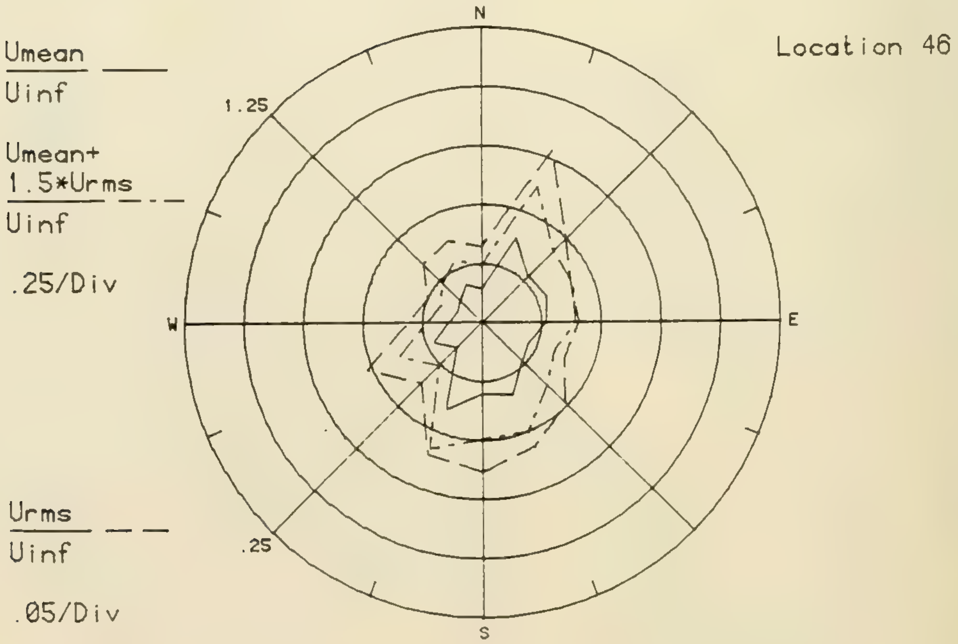

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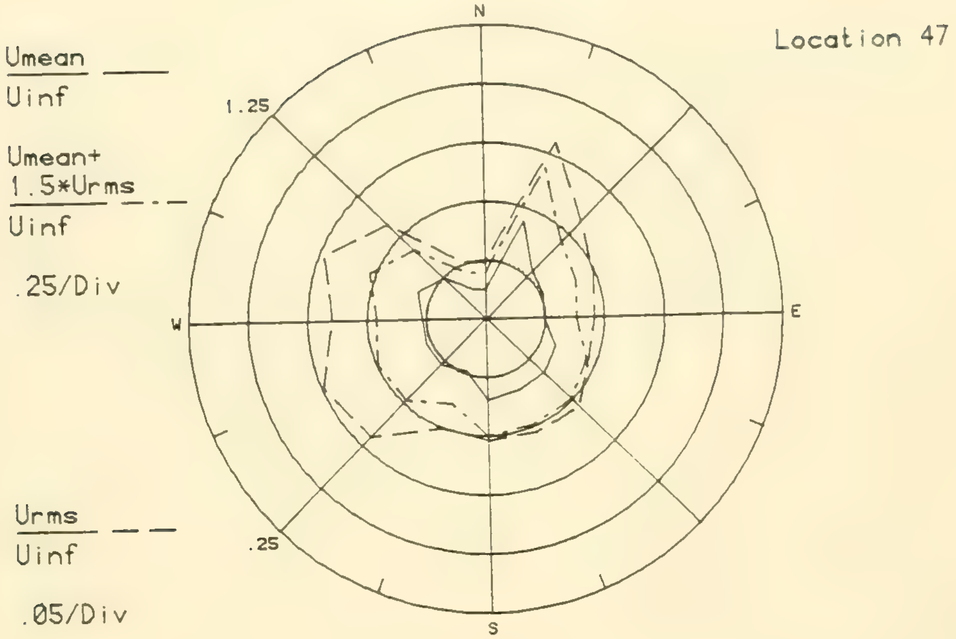
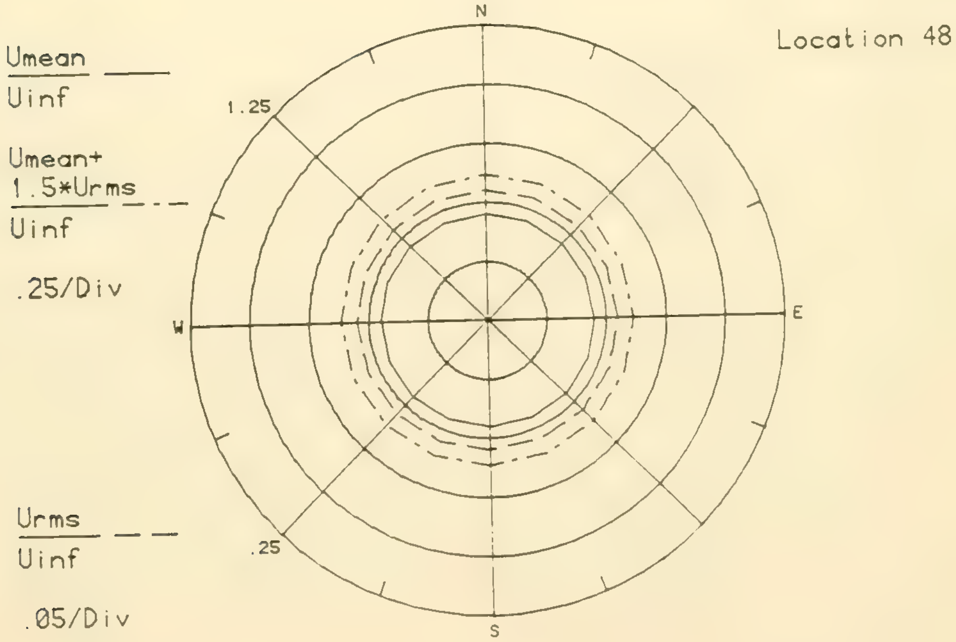
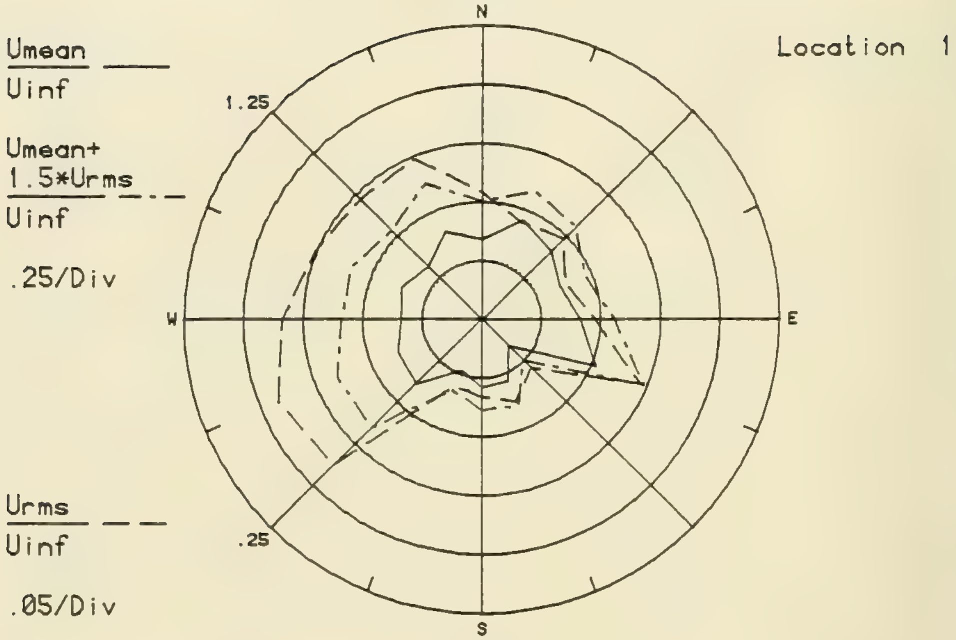
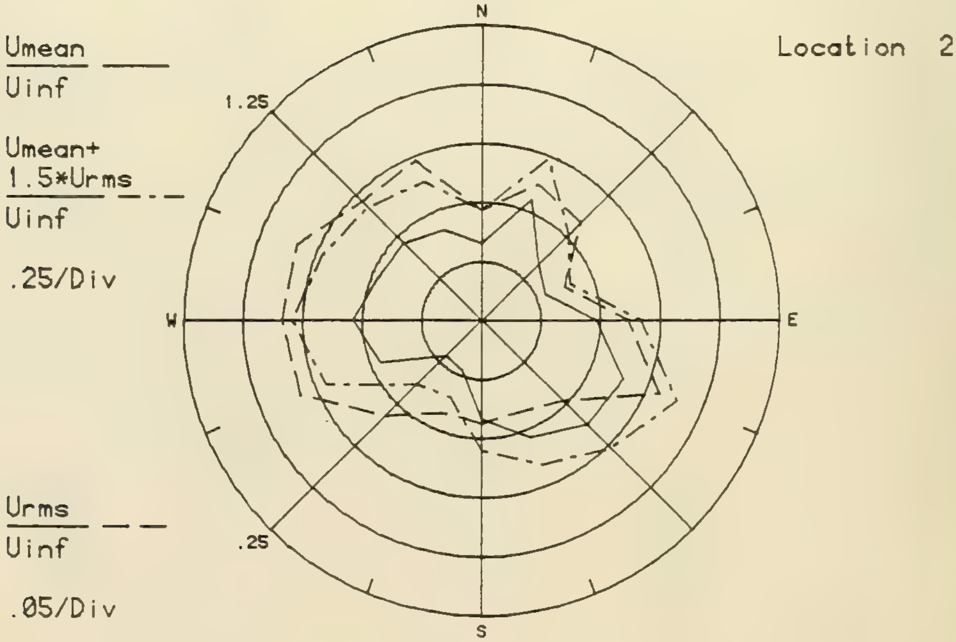




Configuration PH1





Configuration PH1

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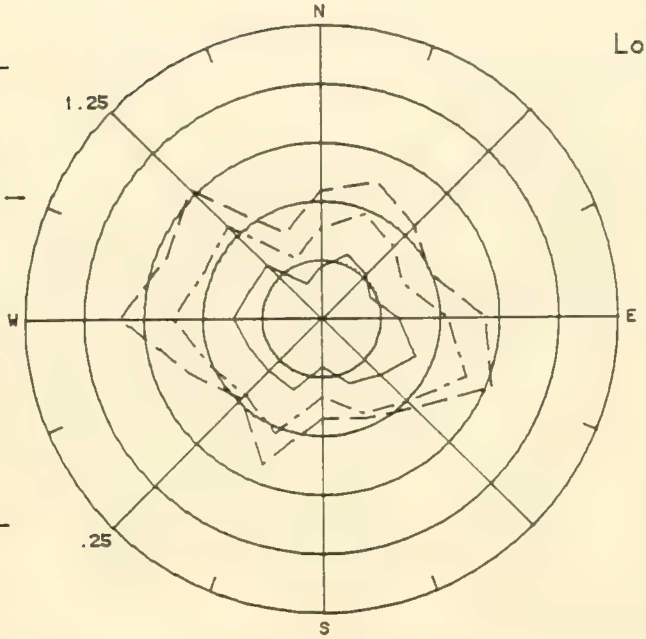
Umean+ 1.5*Urms / Uinf —·—

.25/Div



Urms / Uinf — —

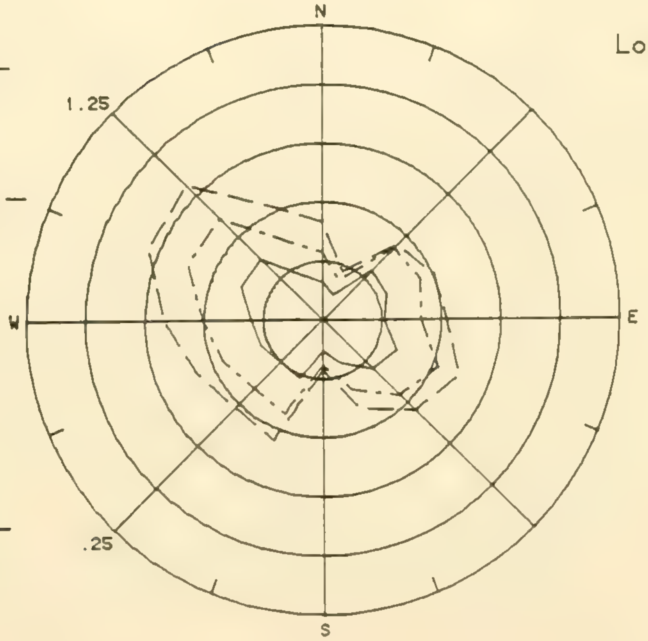
.05/Div

Location 4

Umean / Uinf ———

Umean+ 1.5*Urms / Uinf —·—

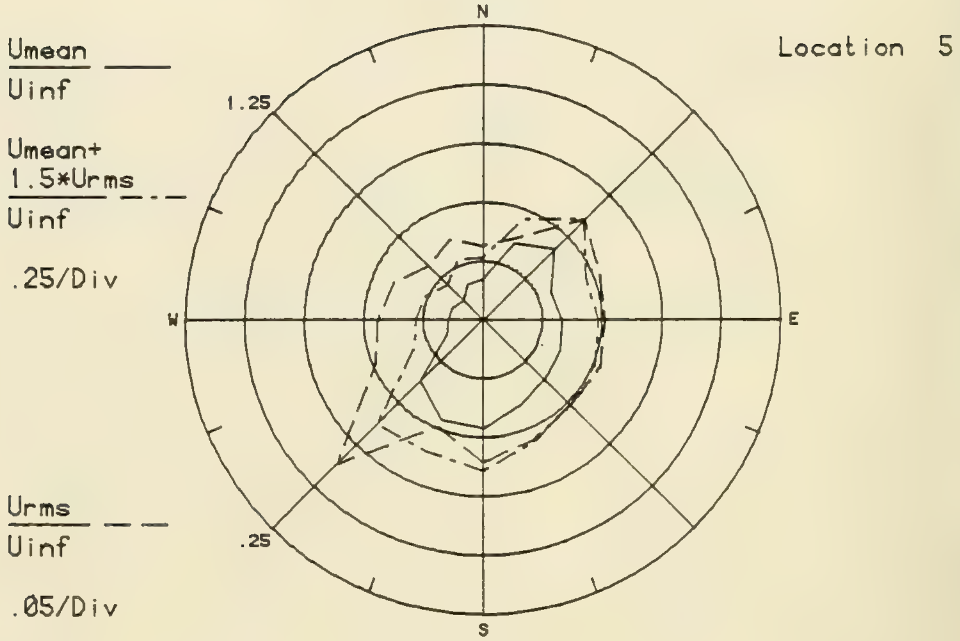
.25/Div

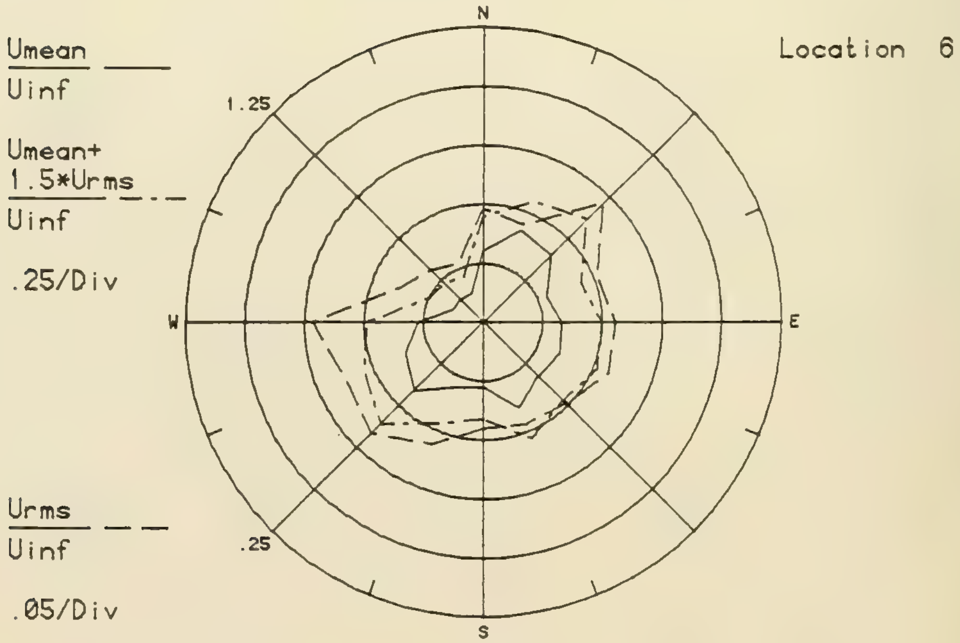


Urms / Uinf — —

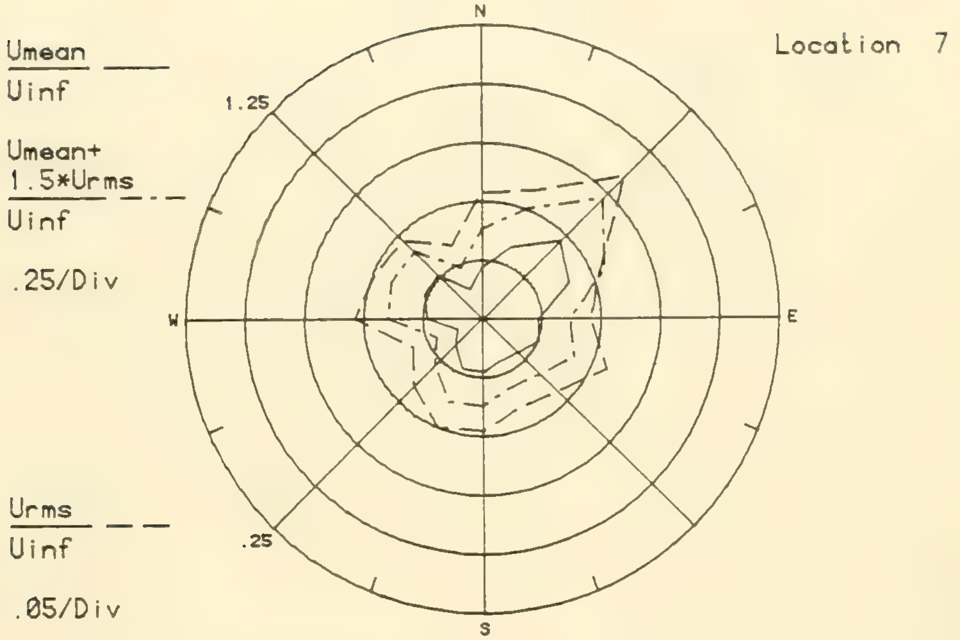
.05/Div

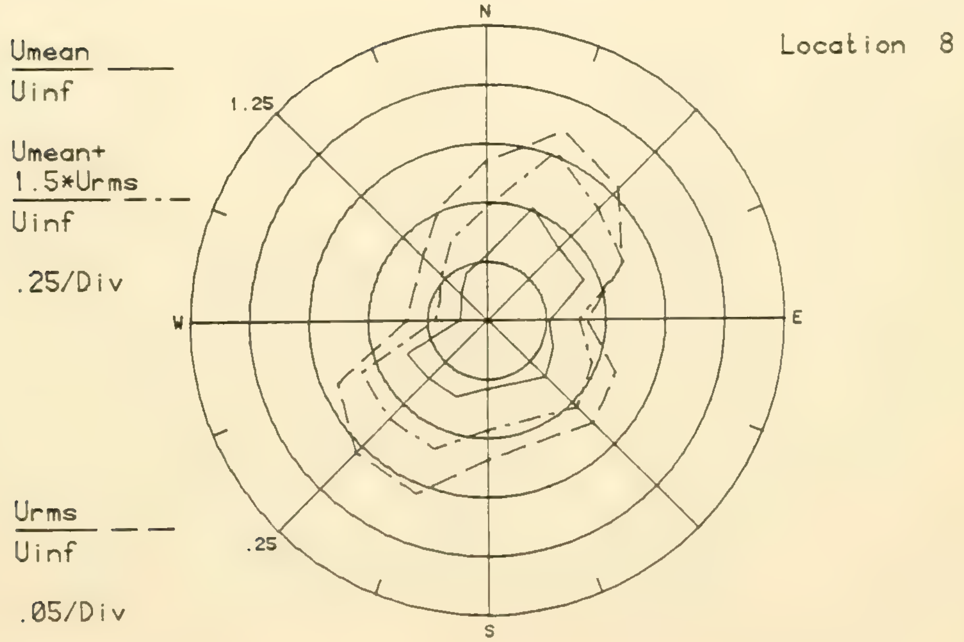
Configuration PH1





Configuration PH1





Configuration PH1

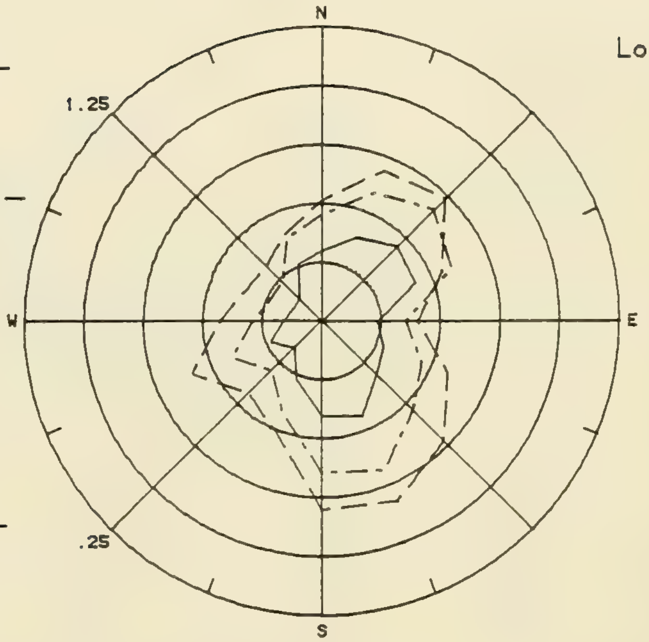
Umean
——— ———
Uinf

Umean+
1.5*Urms
——— — - —
Uinf

.25/Div

Urms
——— — —
Uinf

.05/Div



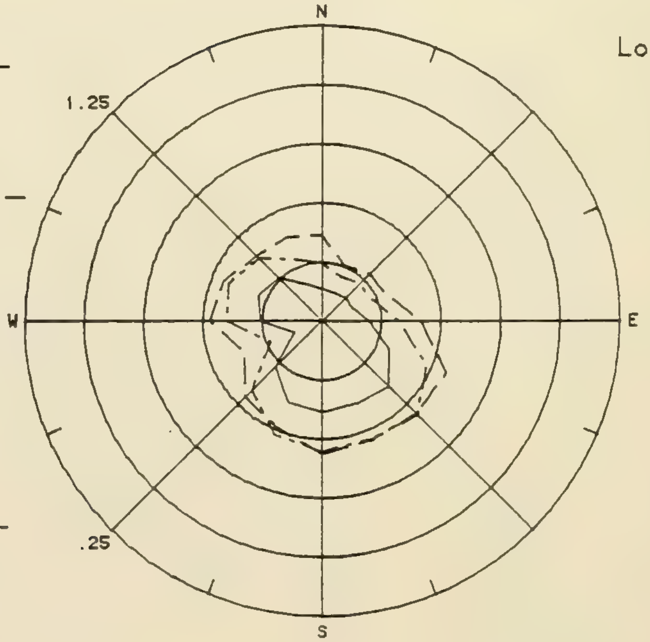
Umean
——— ———
Uinf

Umean+
1.5*Urms
——— — - —
Uinf

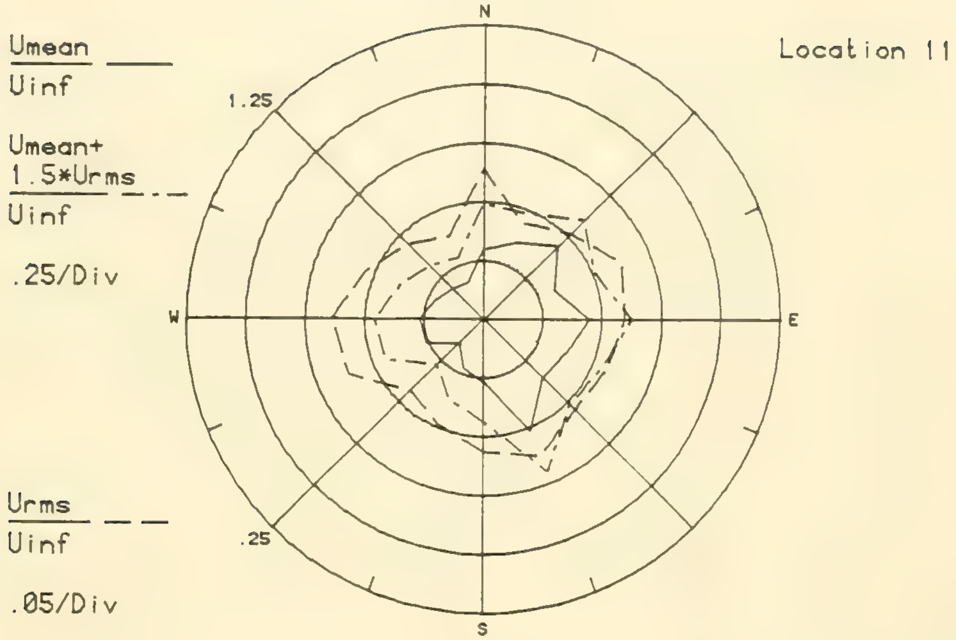
.25/Div

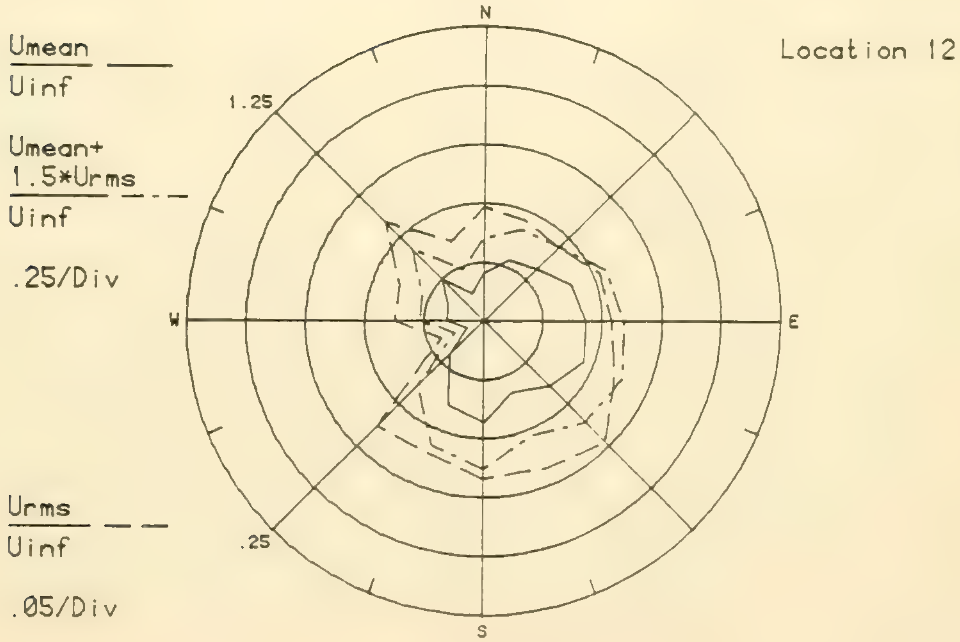
Urms
——— — —
Uinf

.05/Div

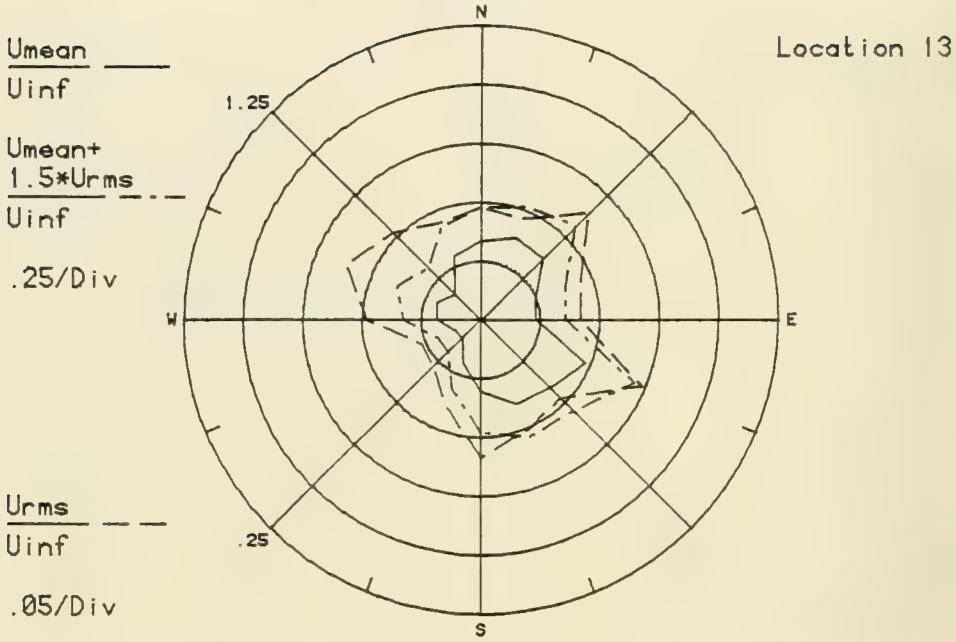


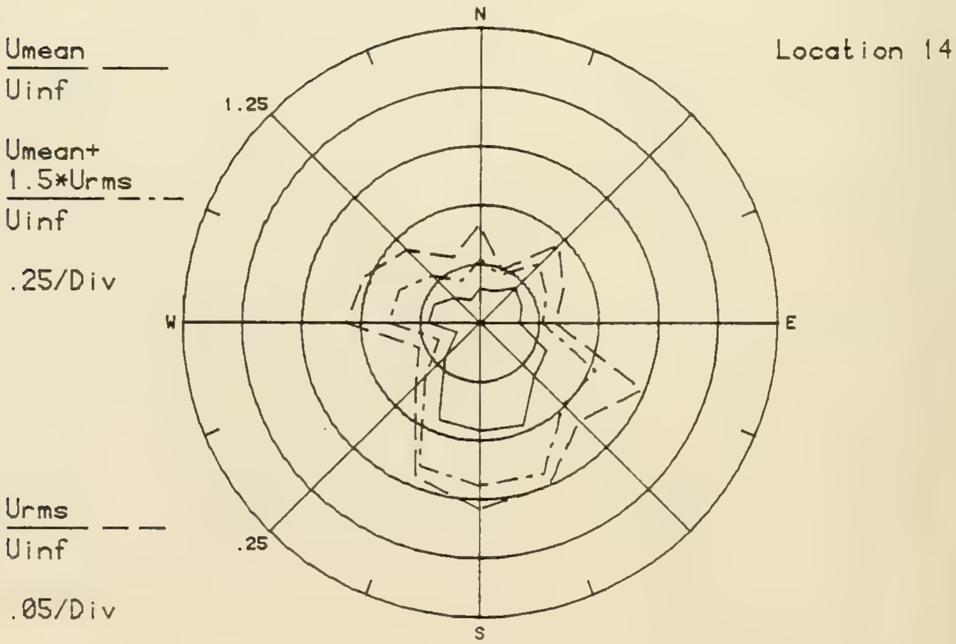
Configuration PH1





Configuration PH1





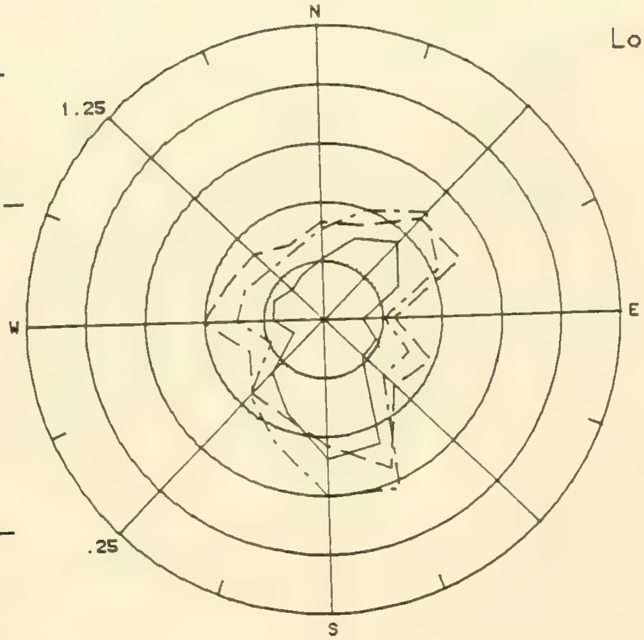
Configuration PH1

Location 15

Umean / Uinf ————

Umean+ 1.5*Urms / Uinf — · —

.25/Div



Urms / Uinf — —

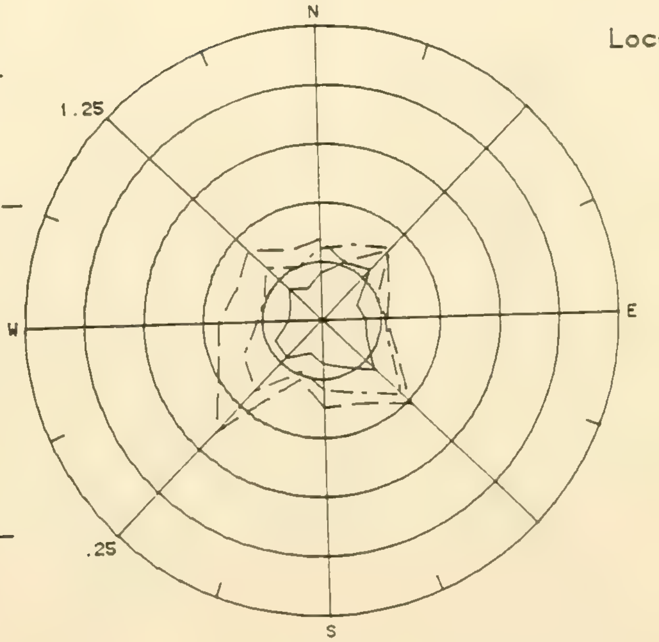
.05/Div

Location 16

Umean / Uinf ————

Umean+ 1.5*Urms / Uinf — · —

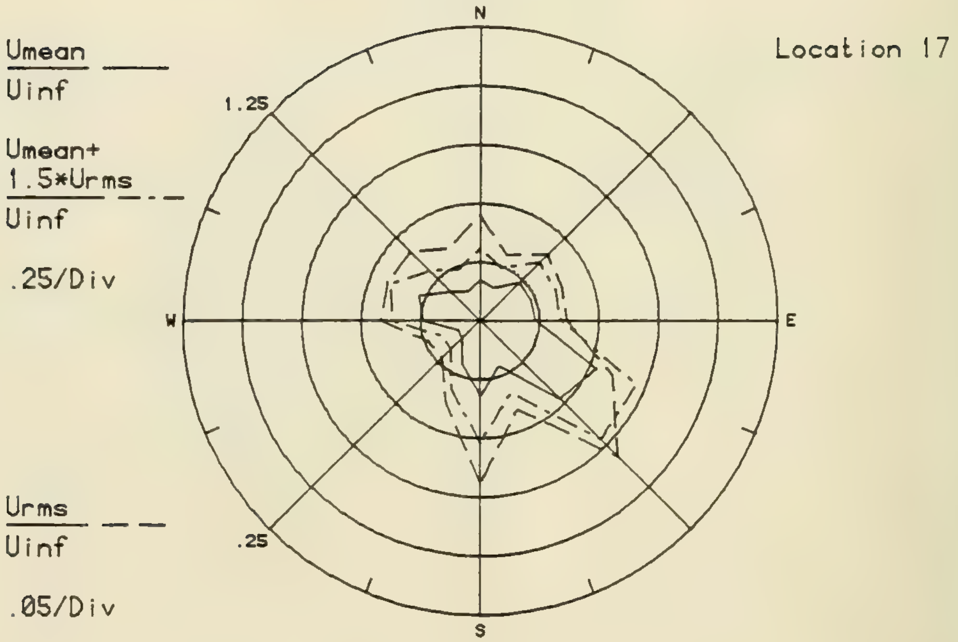
.25/Div

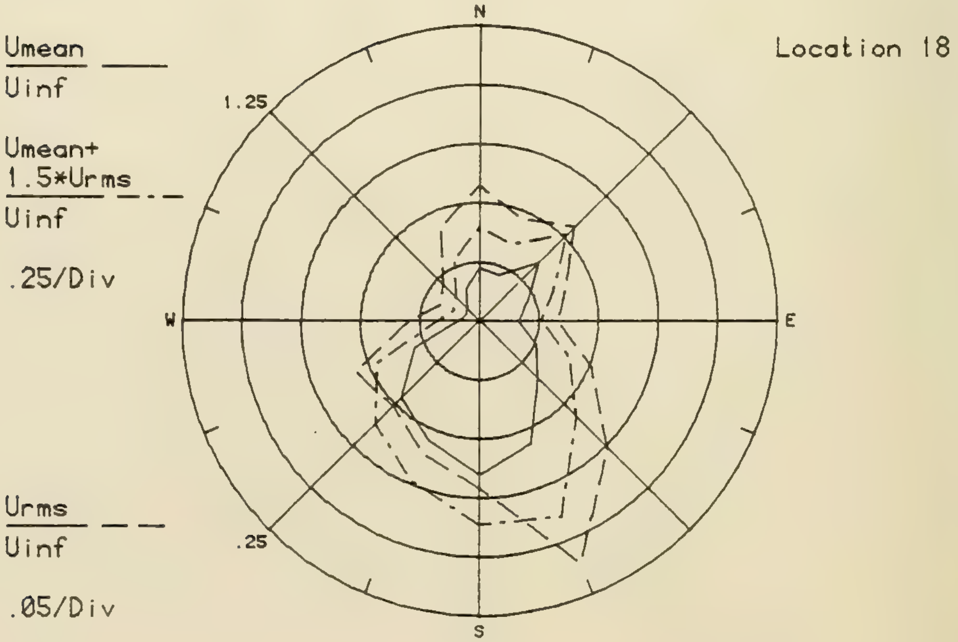


Urms / Uinf — —

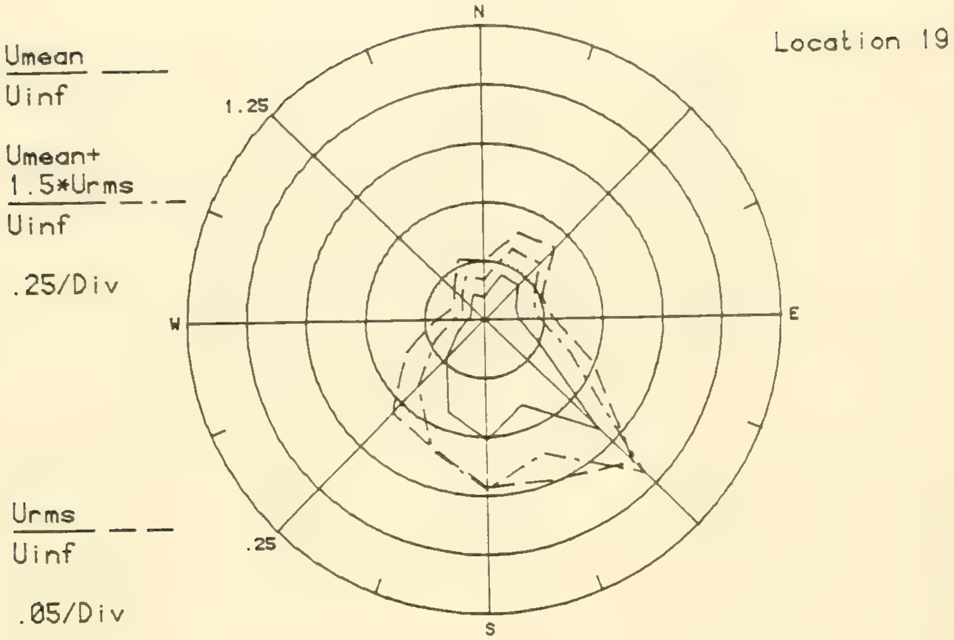
.05/Div

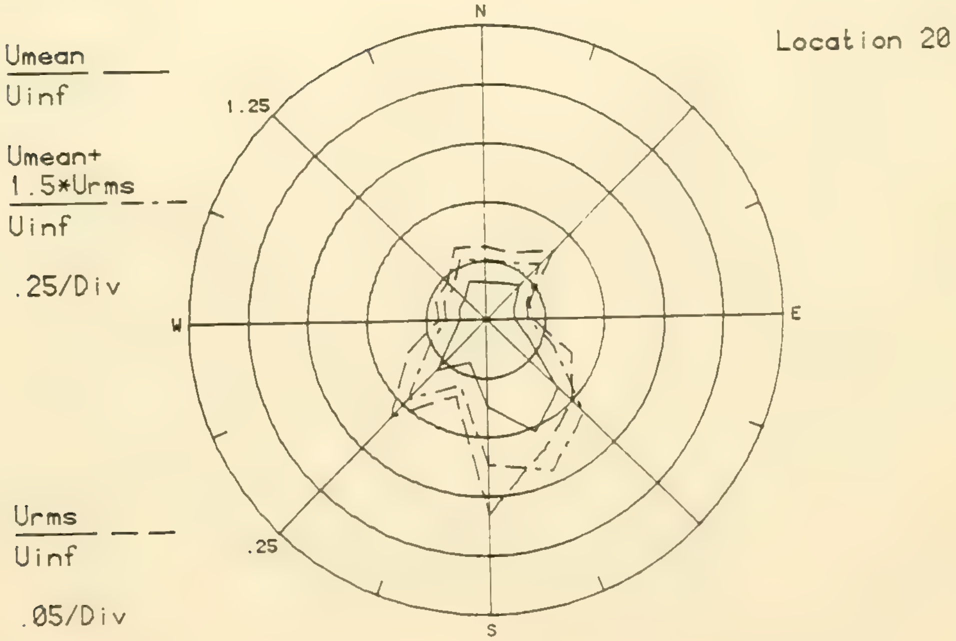
Configuration PH1



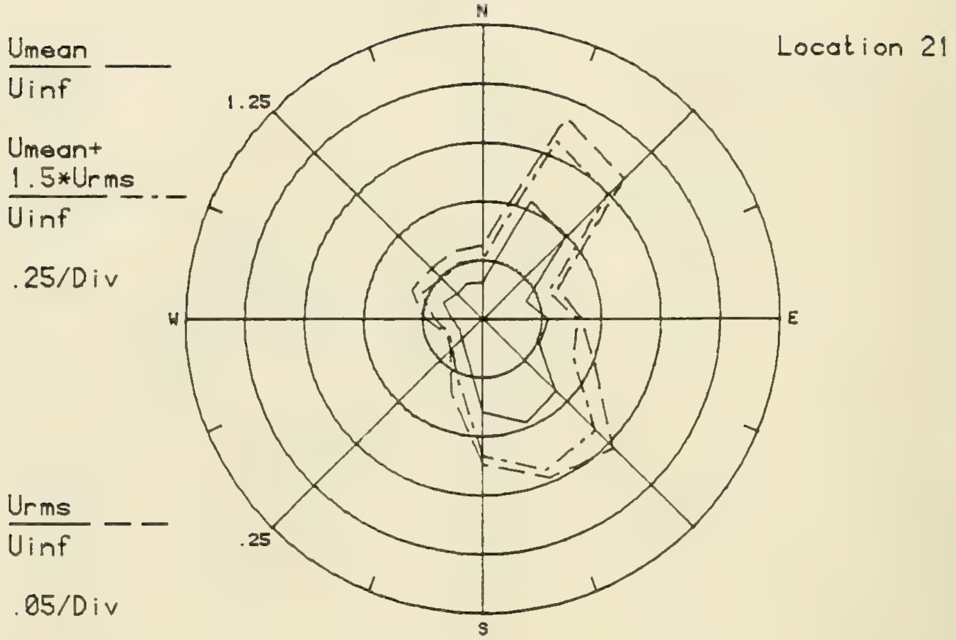


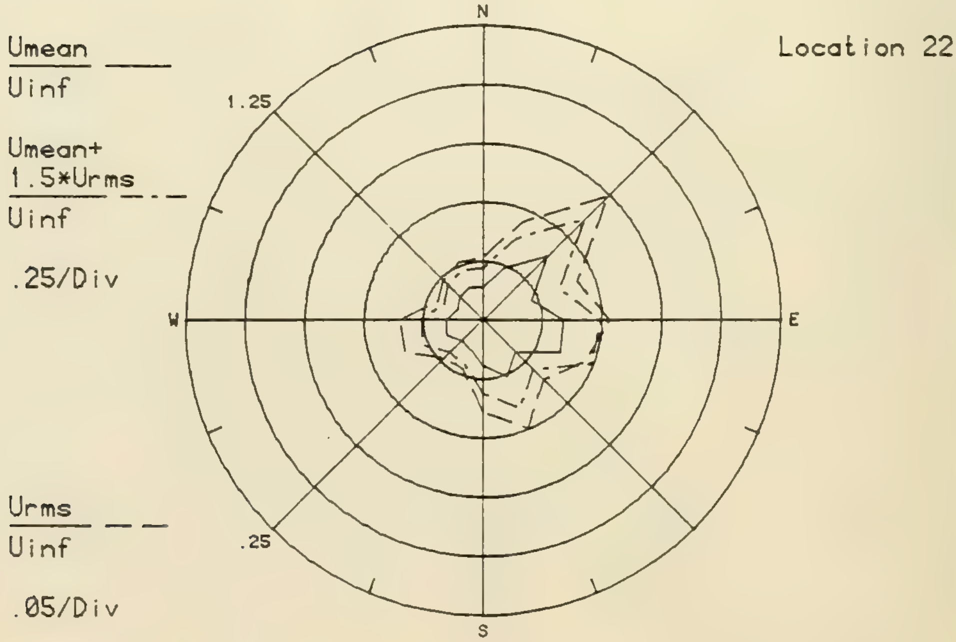
Configuration PH1



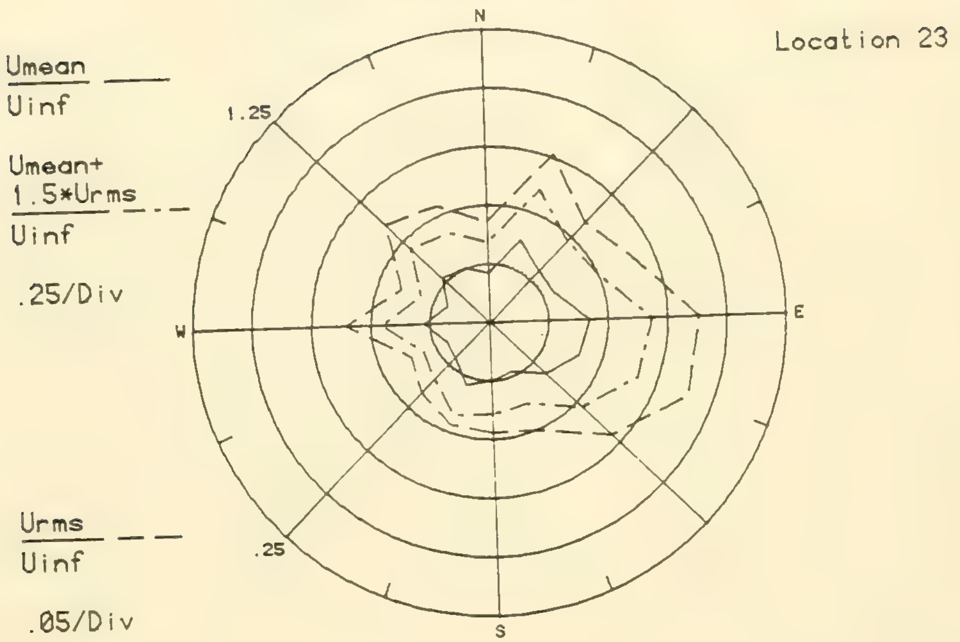


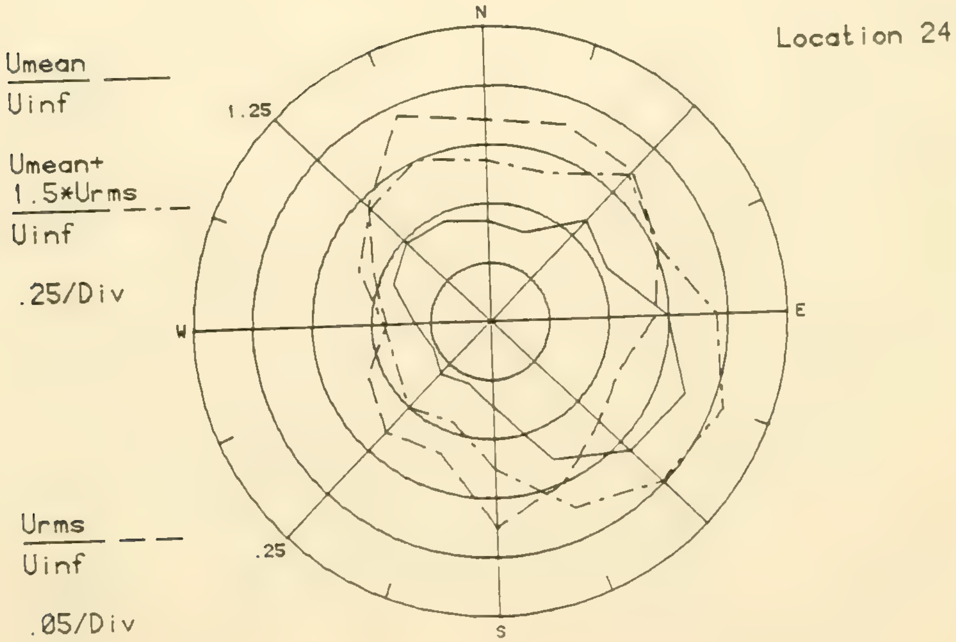
Configuration PH1



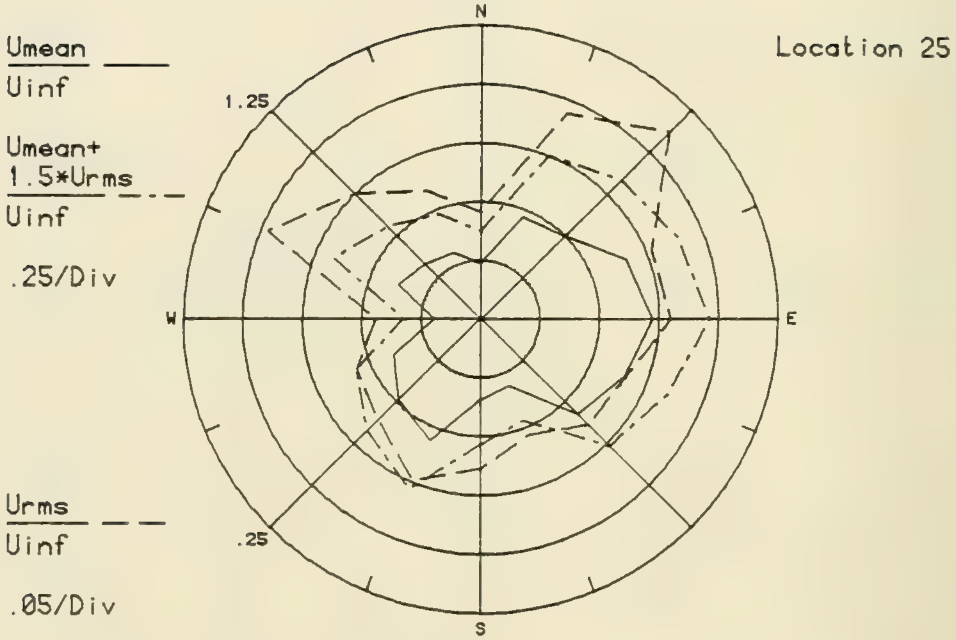


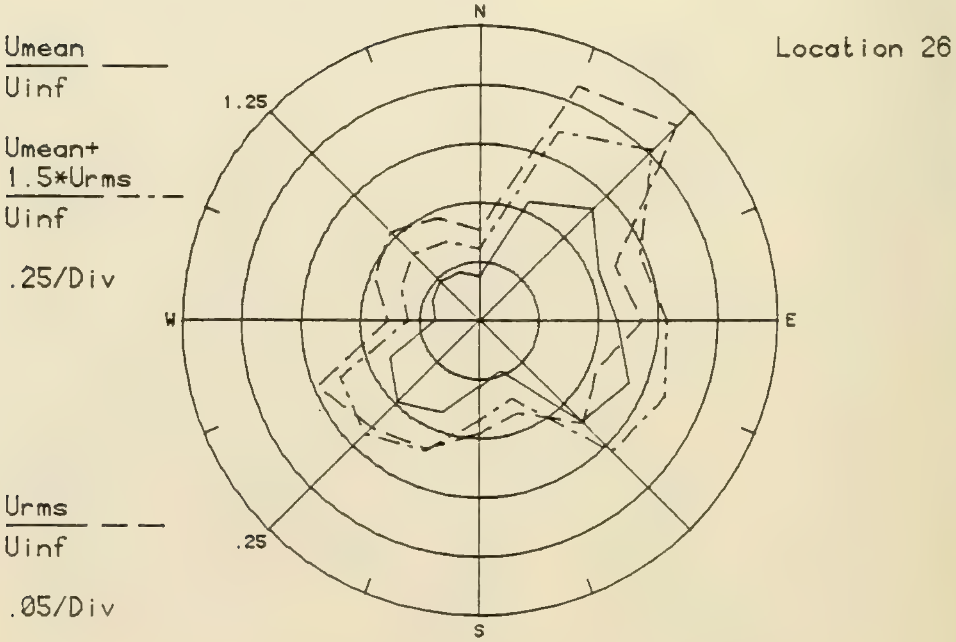
Configuration PH1



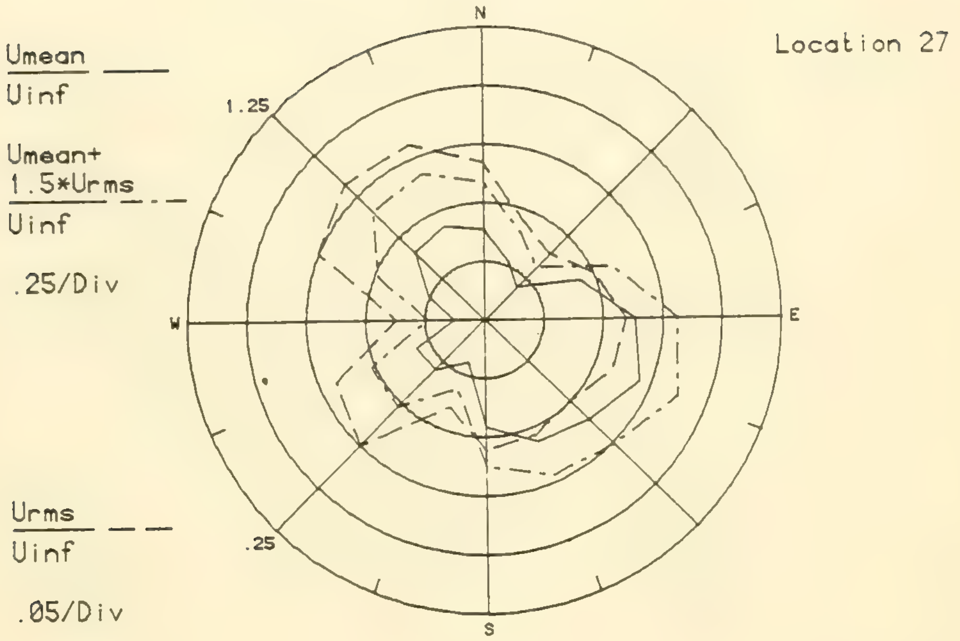


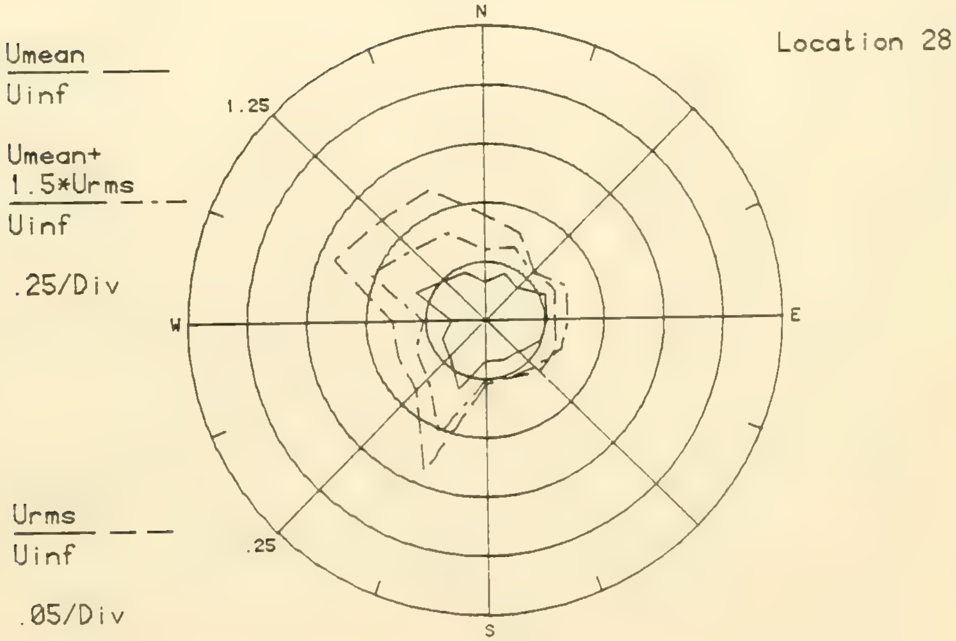
Configuration PH1



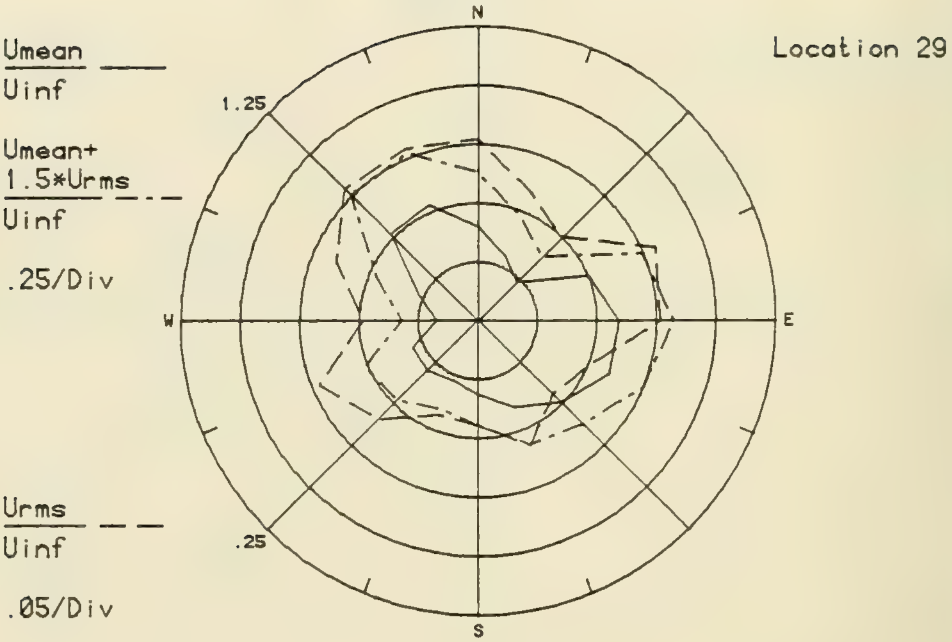


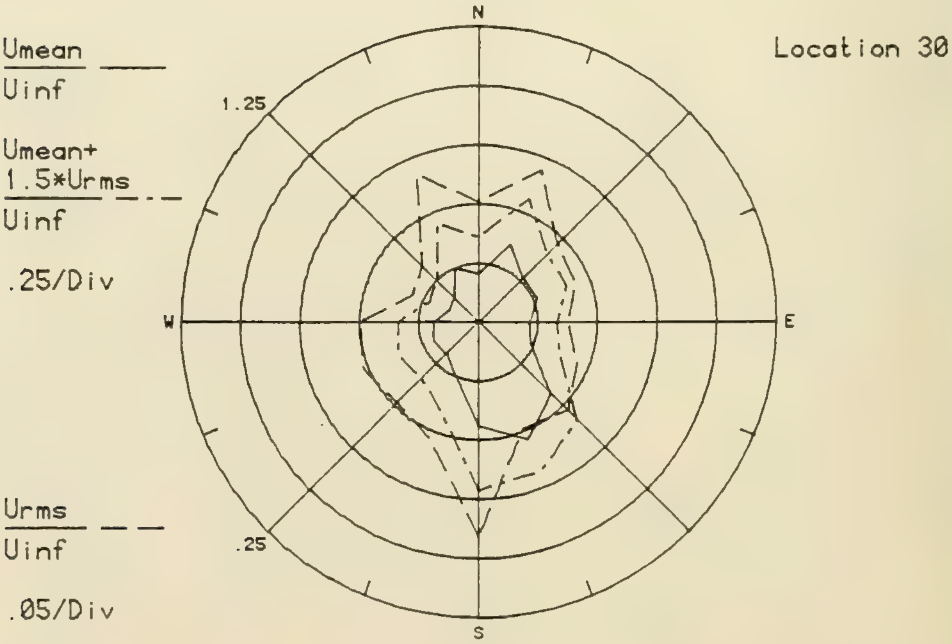
Configuration PH1



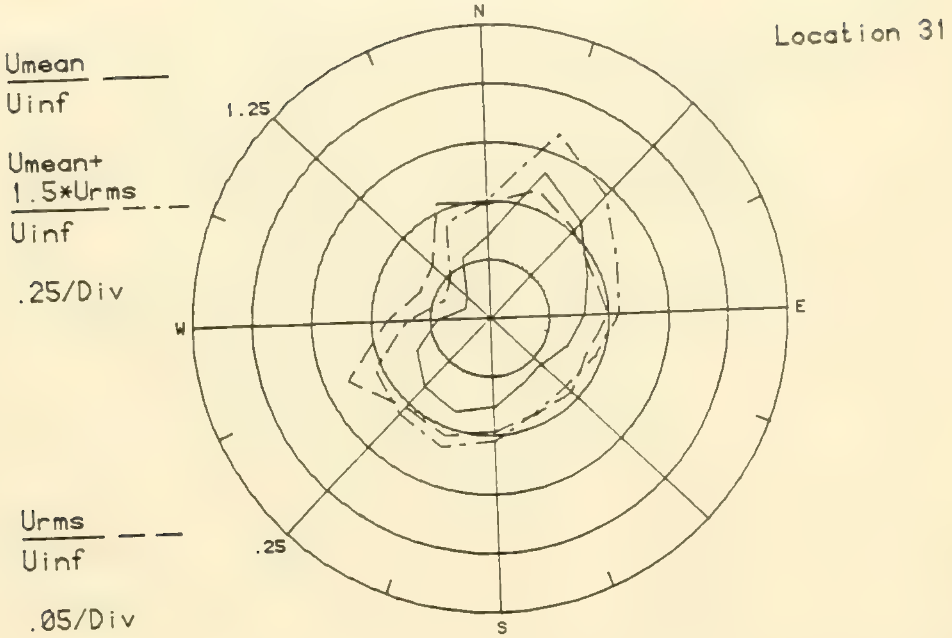


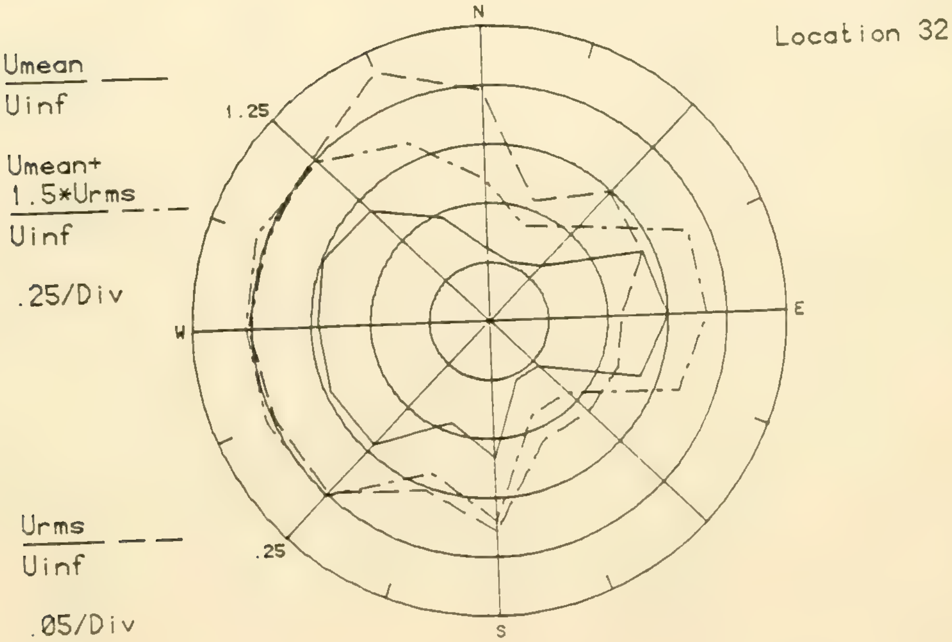
Configuration PH1



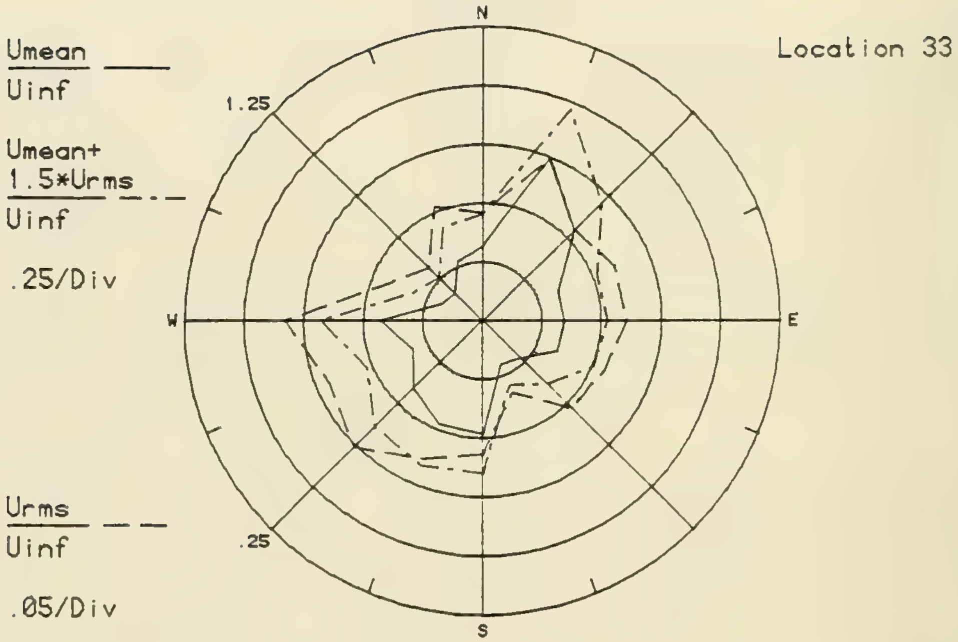


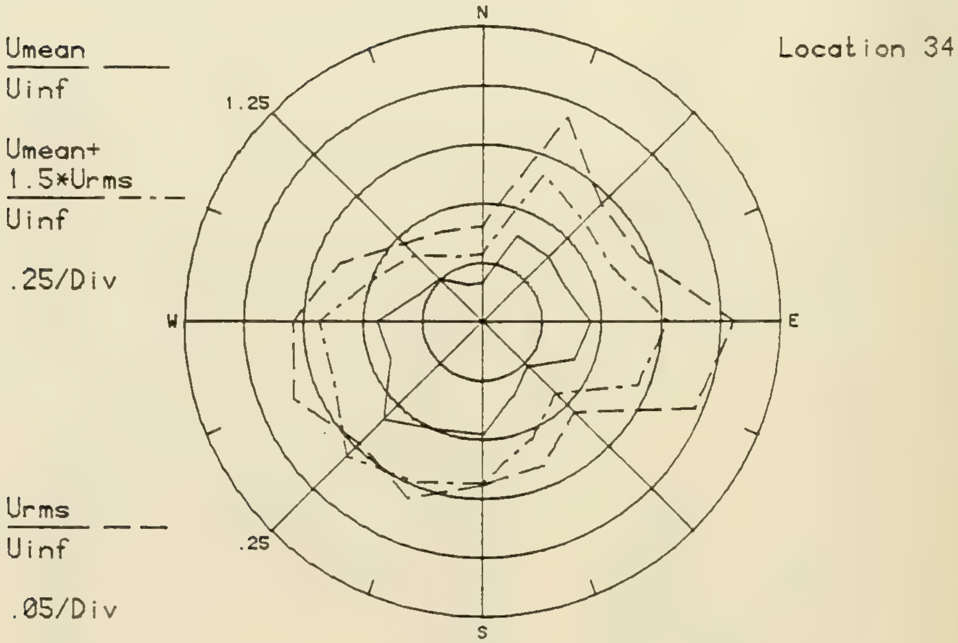
Configuration PH1



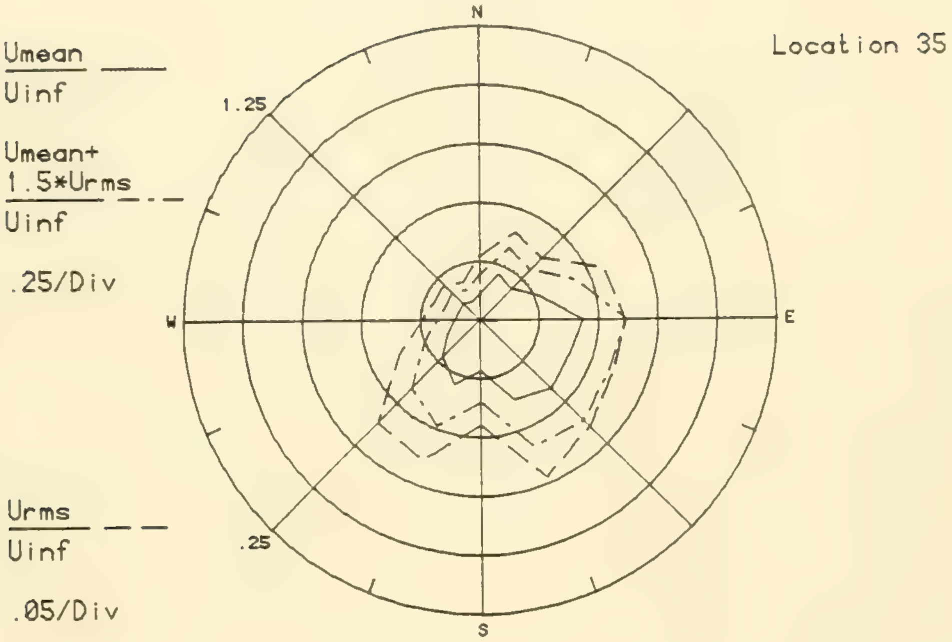


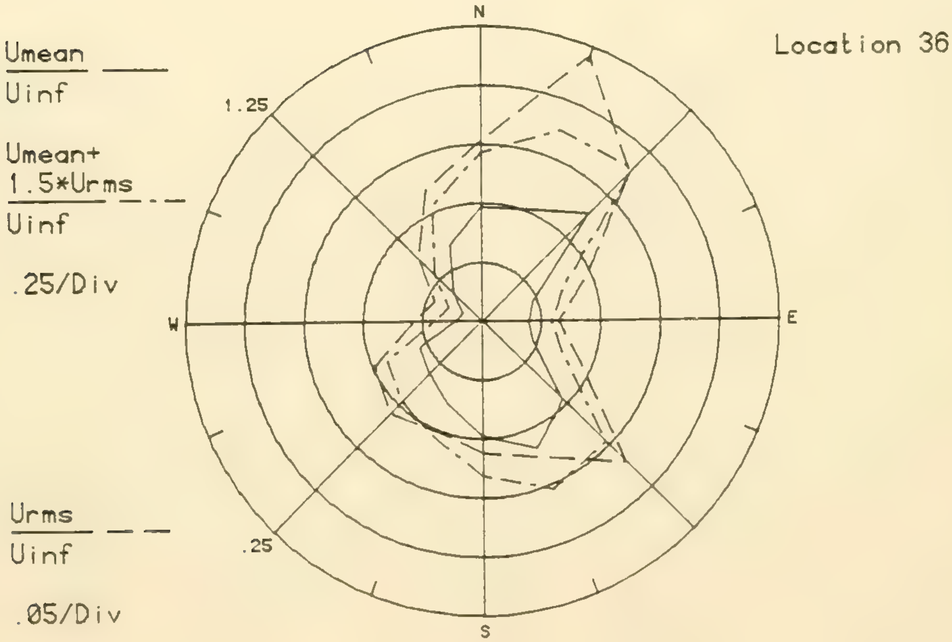
Configuration PH1



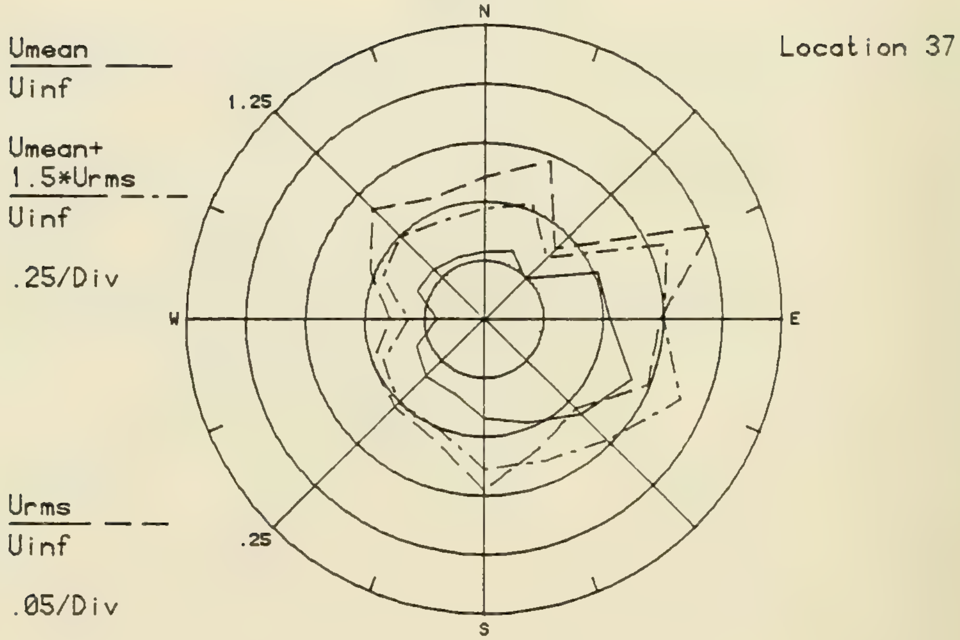


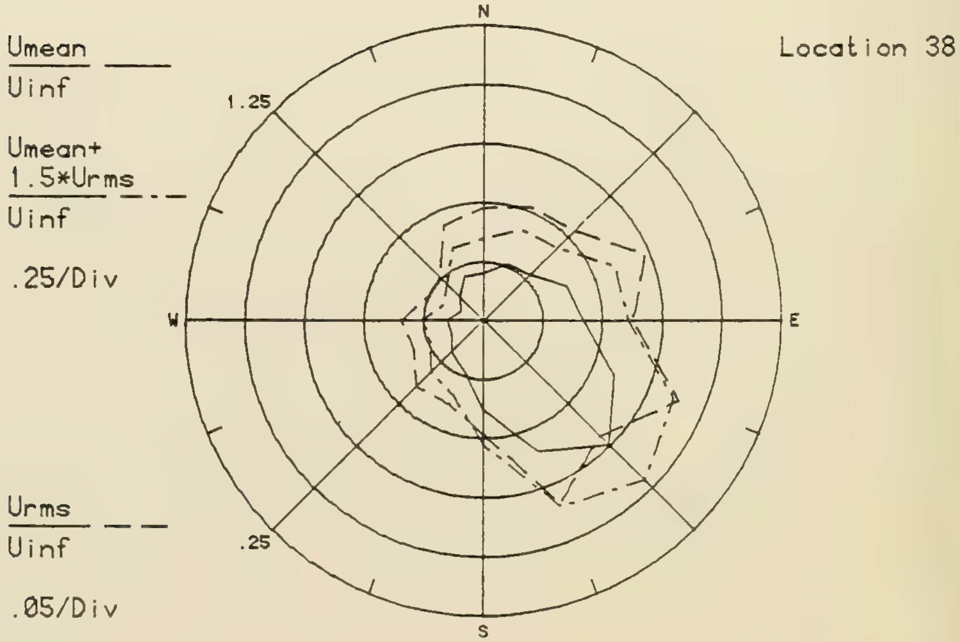
Configuration PH1



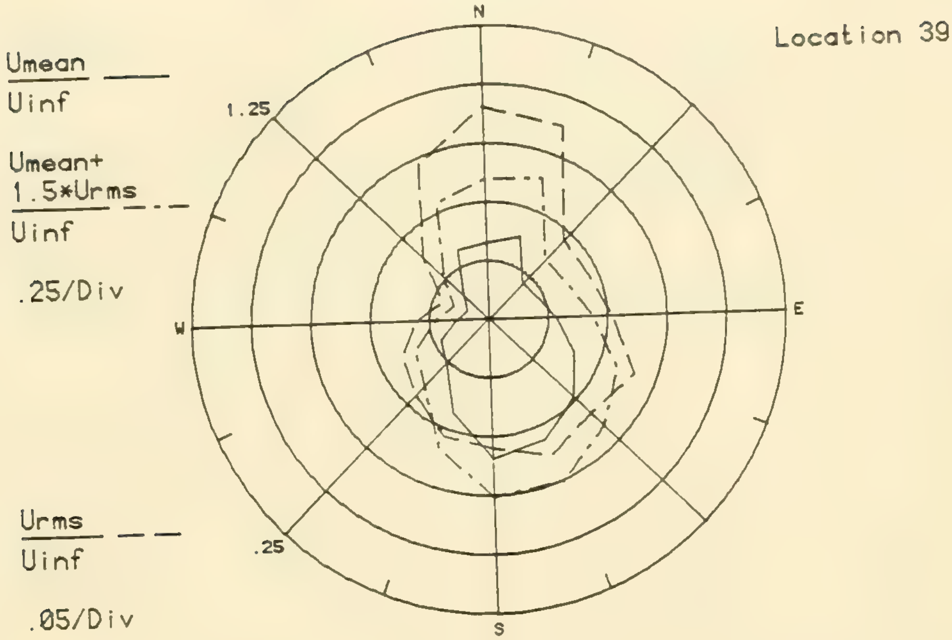


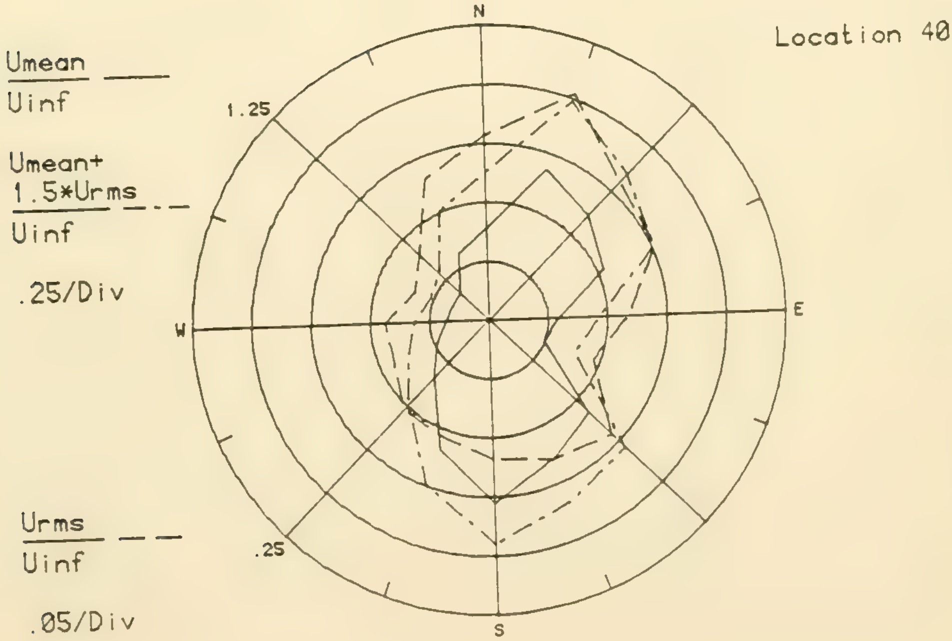
Configuration PH1





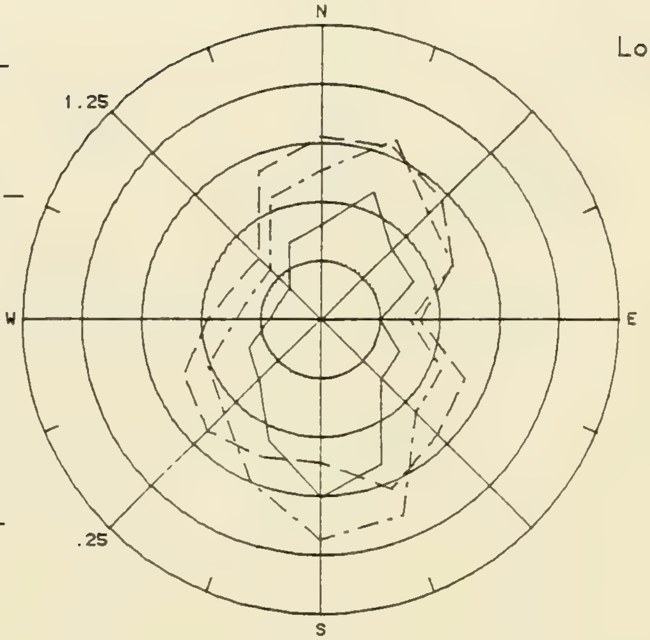
Configuration PH1





Configuration PH1

Location 41



Umean / Uinf ——

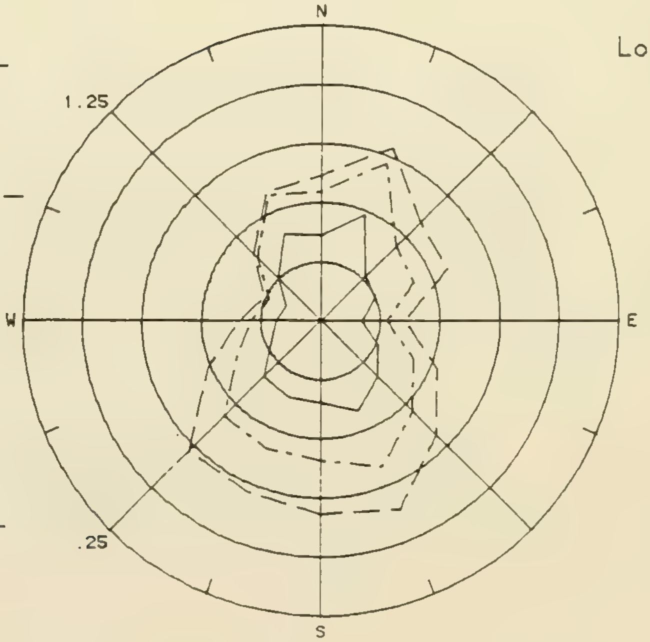
Umean+ 1.5*Urms / Uinf —·—

.25/Div

Urms / Uinf — —

.05/Div

Location 42



Umean / Uinf ——

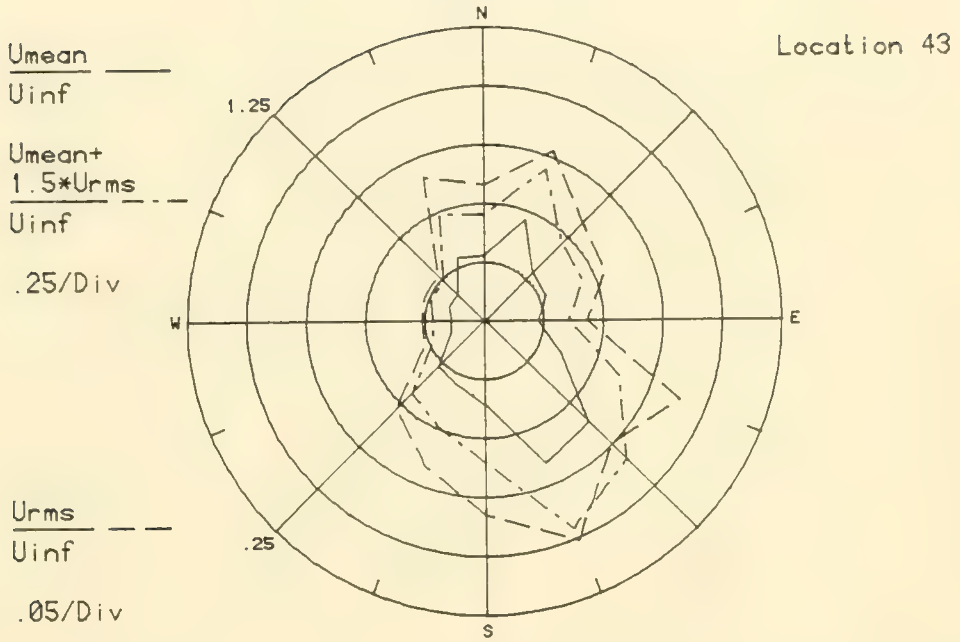
Umean+ 1.5*Urms / Uinf —·—

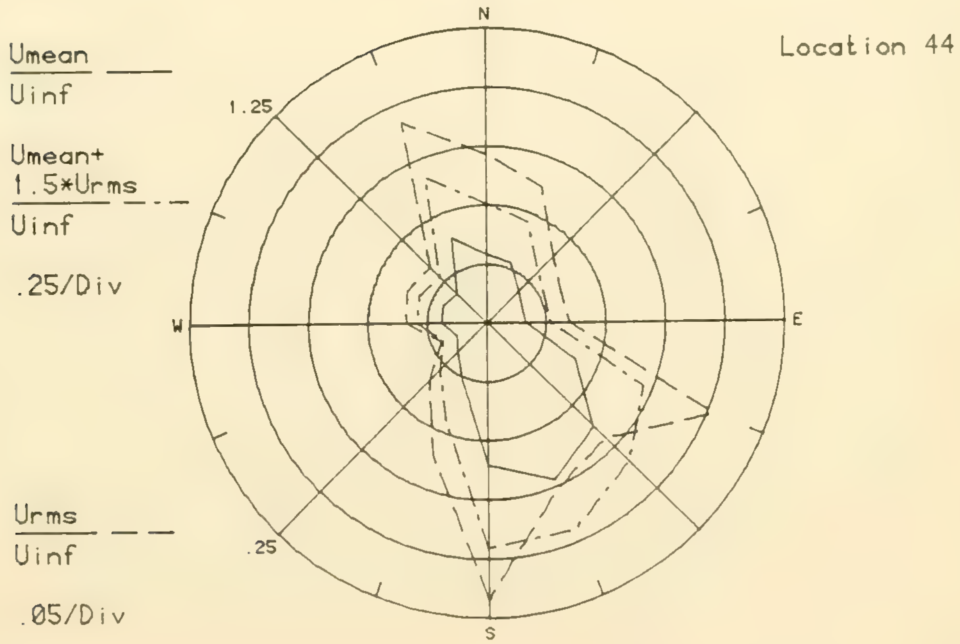
.25/Div

Urms / Uinf — —

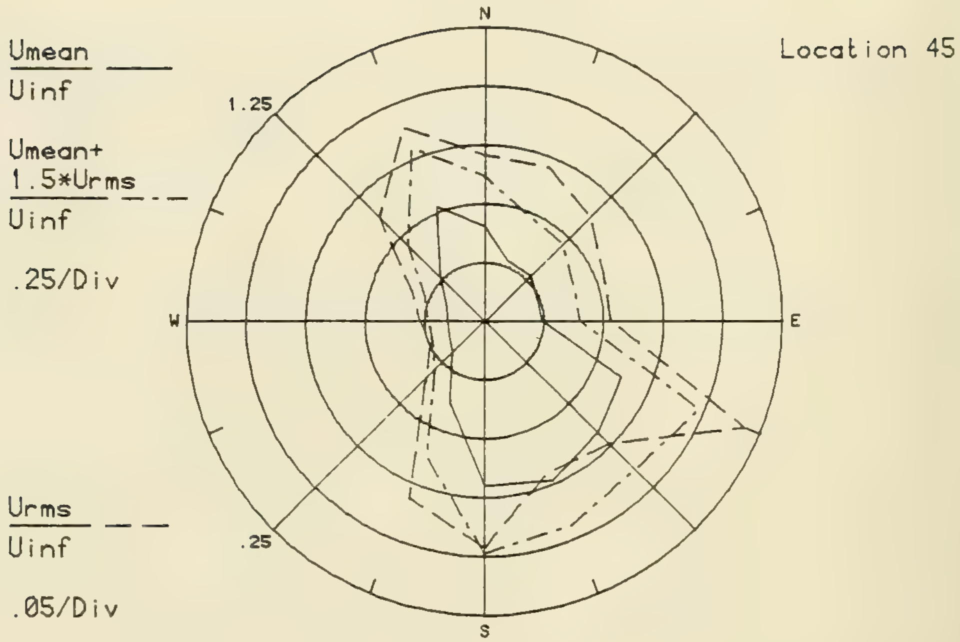
.05/Div

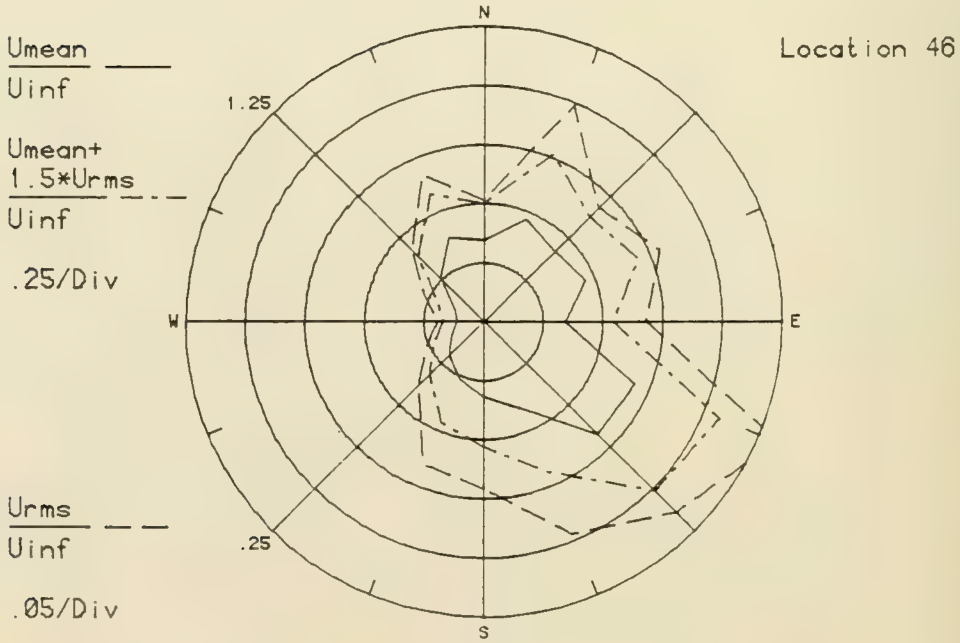
Configuration PH1



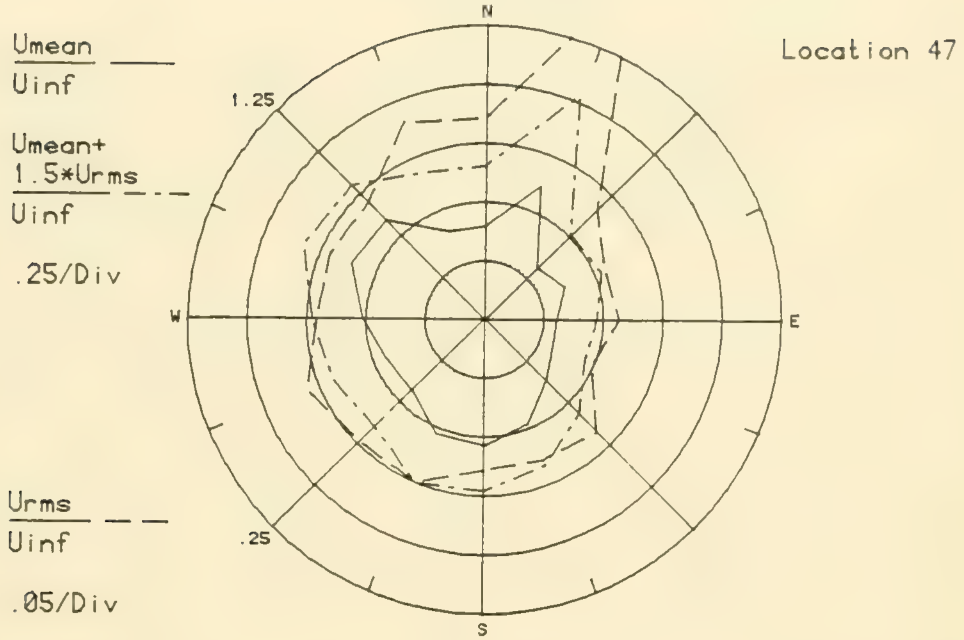


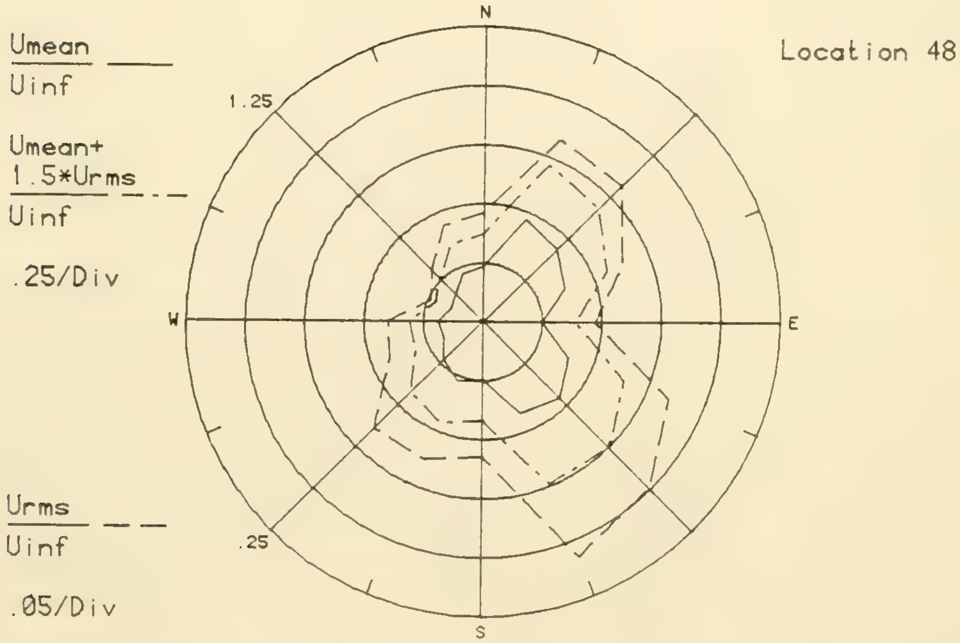
Configuration PH1



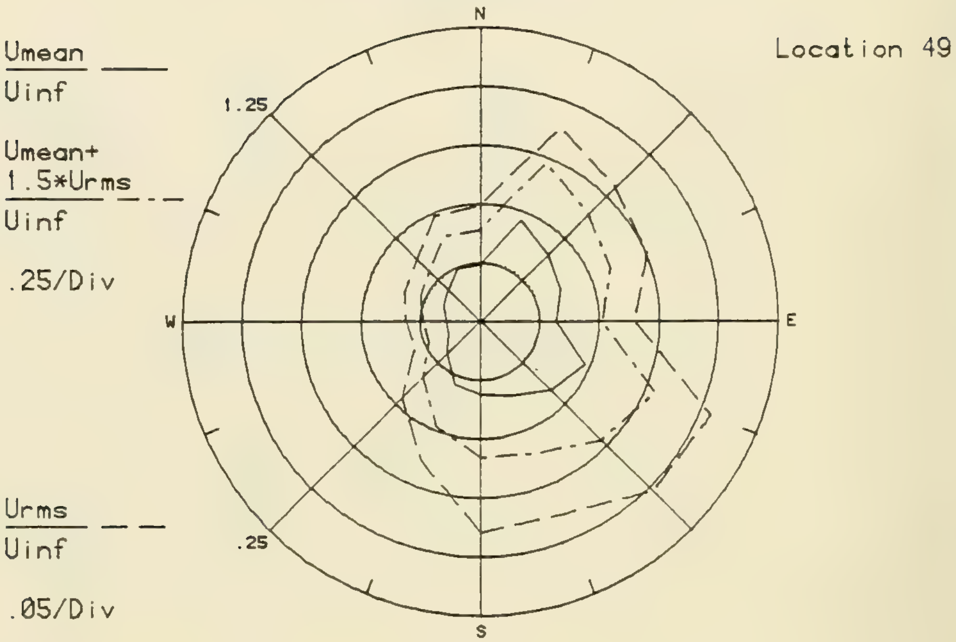


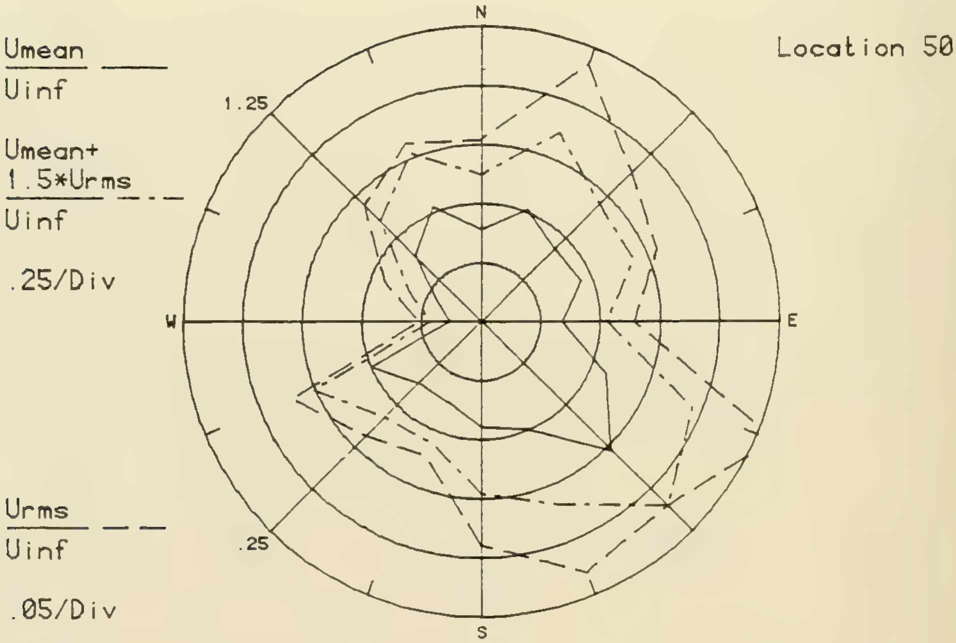
Configuration PH1



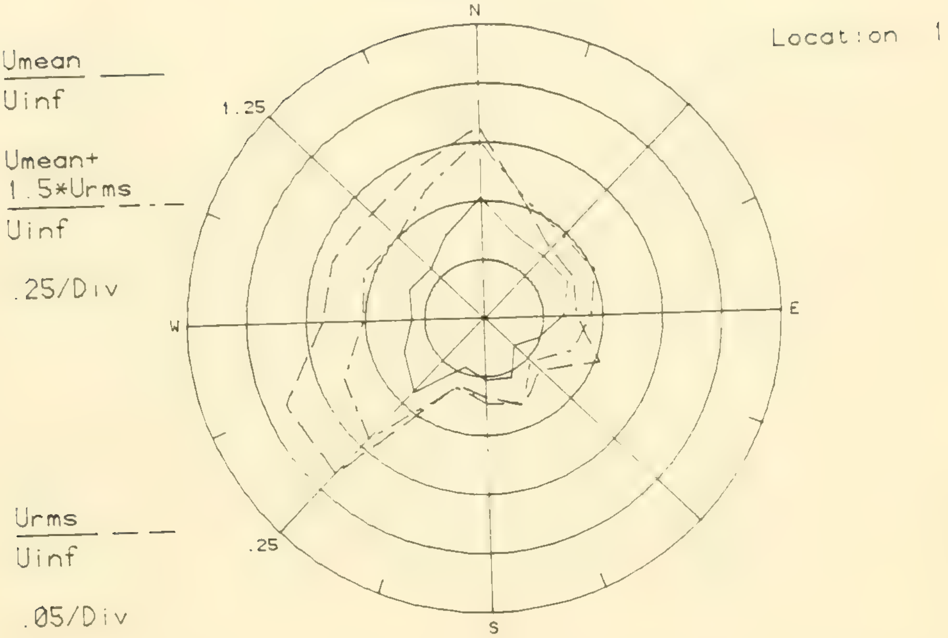


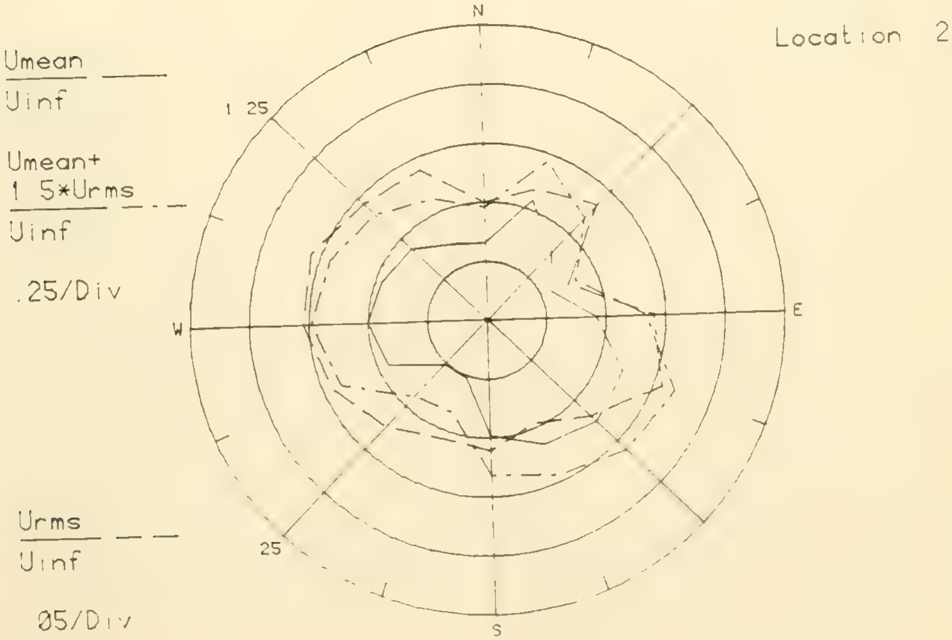
Configuration PH1





Configuration PH 2





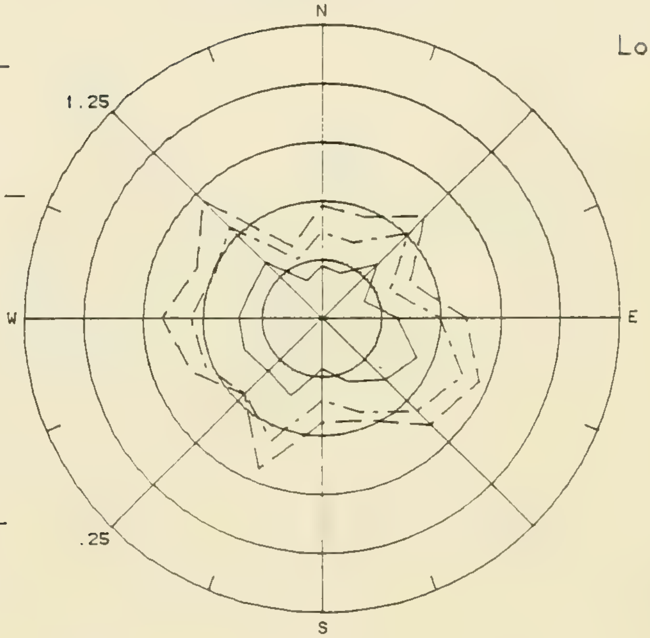
Configuration PH 2

Umean / Uinf ———

Umean+ 1.5*Urms / Uinf — - —

.25/Div

Location 3



Urms / Uinf — —

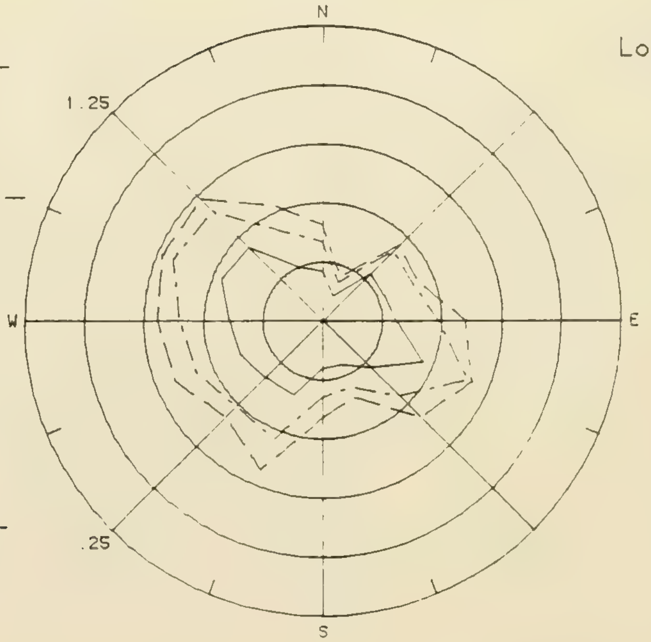
.05/Div

Umean / Uinf ———

Umean+ 1.5*Urms / Uinf — - —

.25/Div

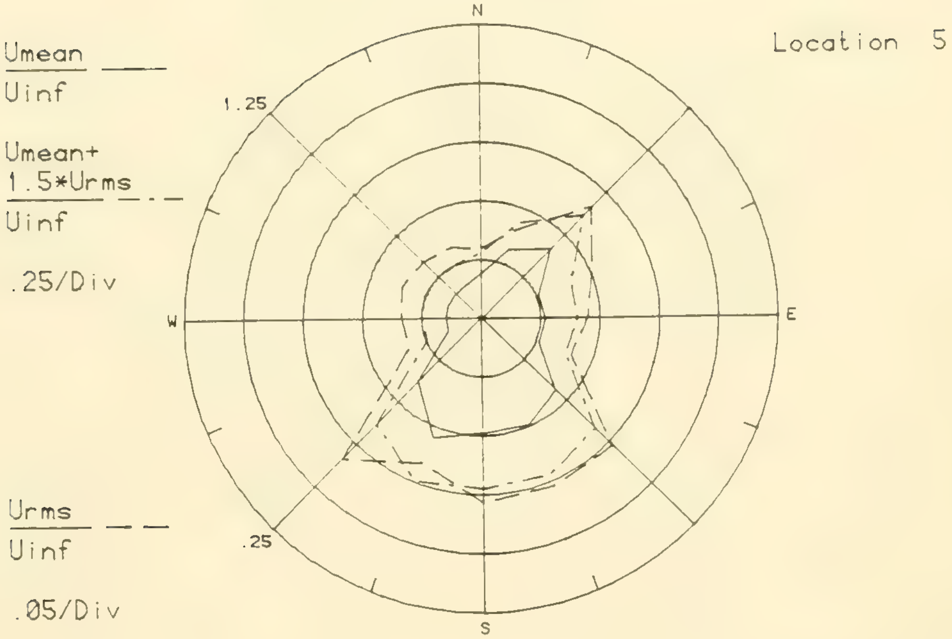
Location 4

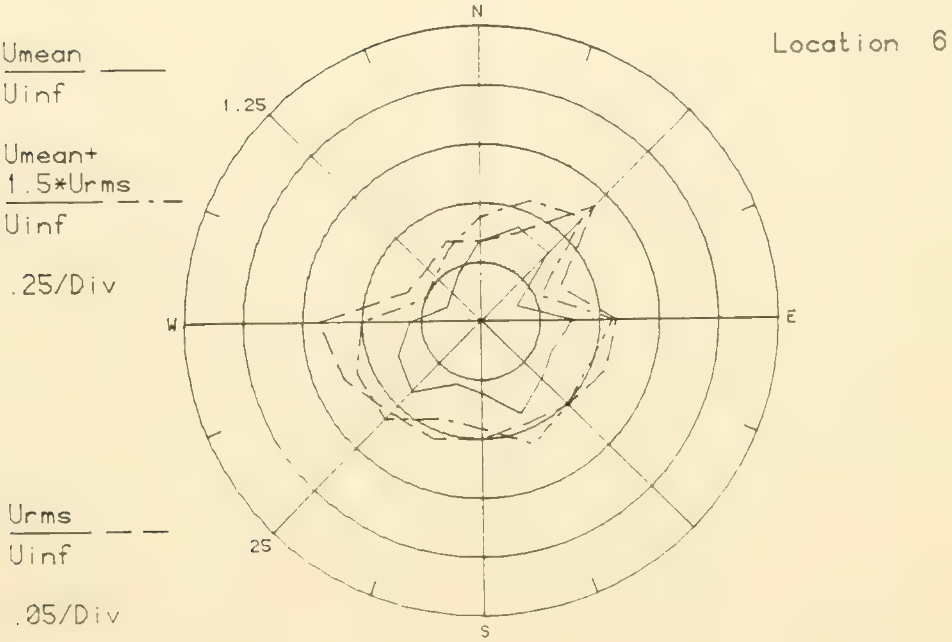


Urms / Uinf — —

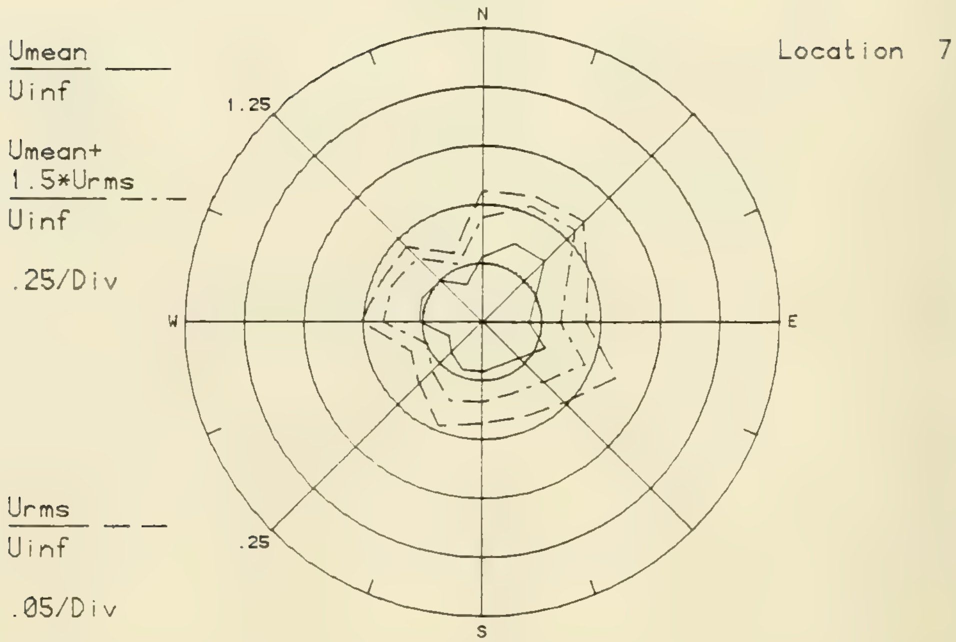
.05/Div

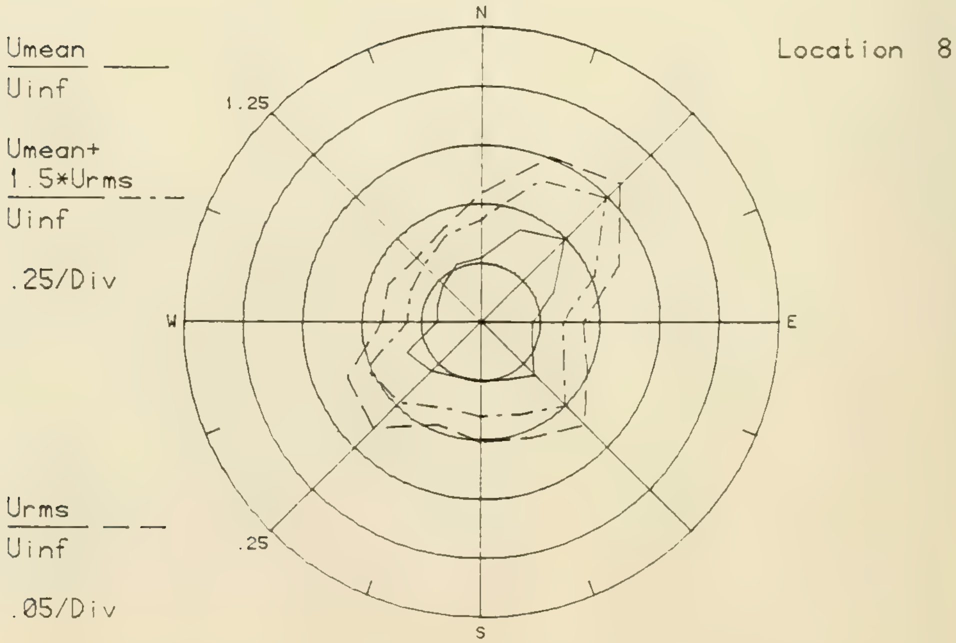
Configuration PH 2



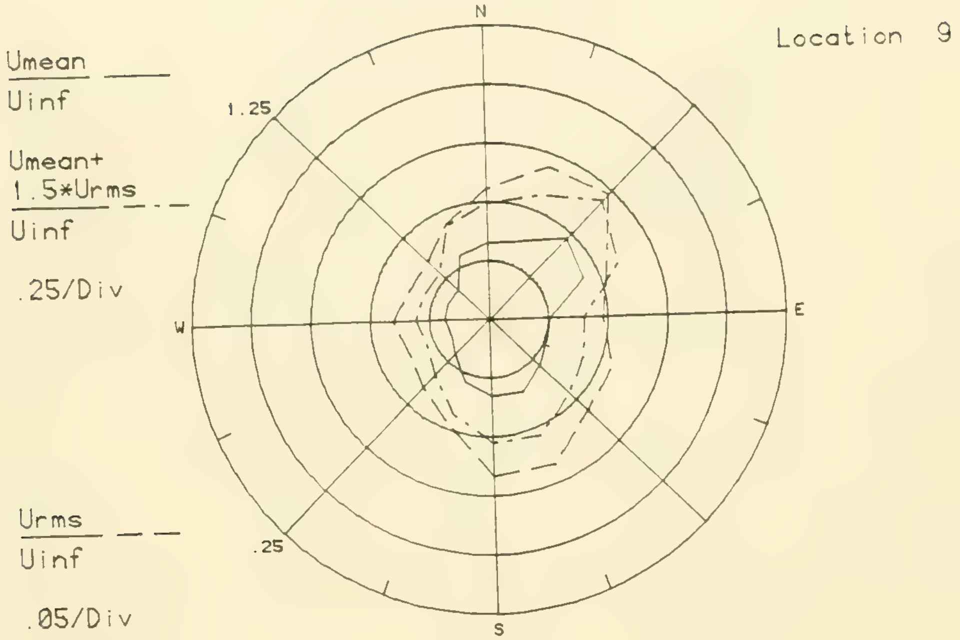


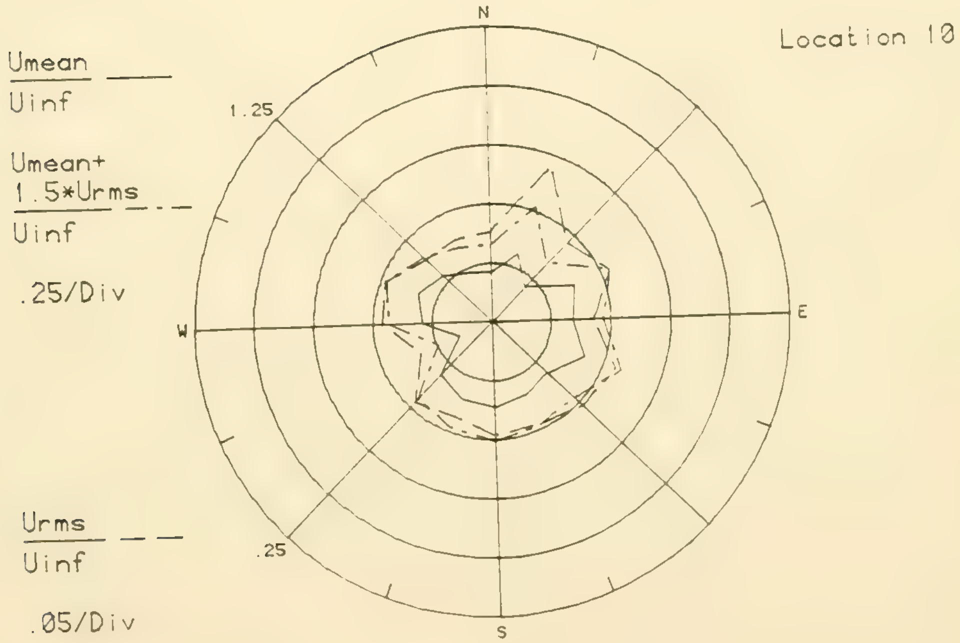
Configuration PH 2



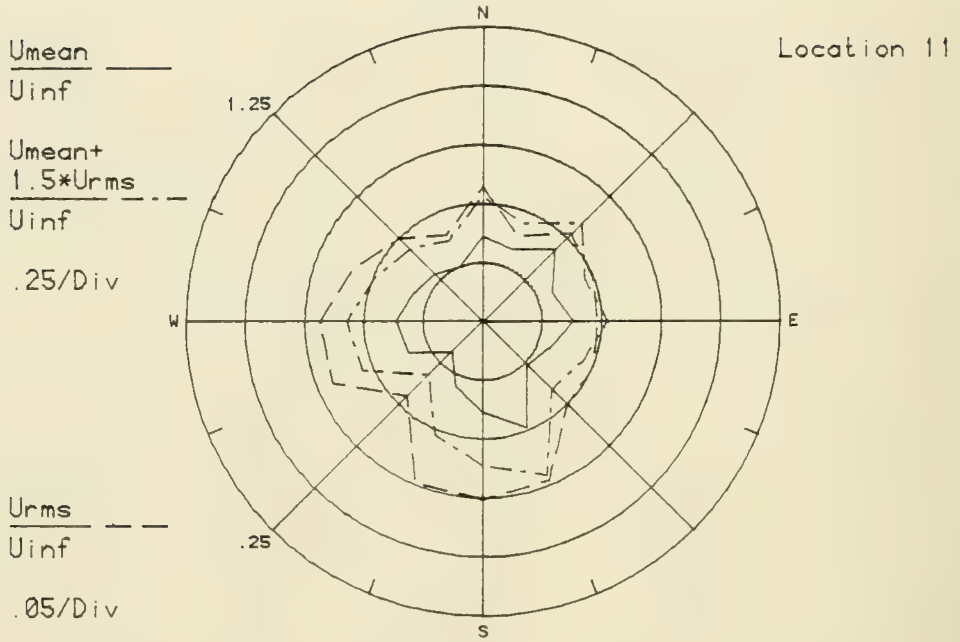


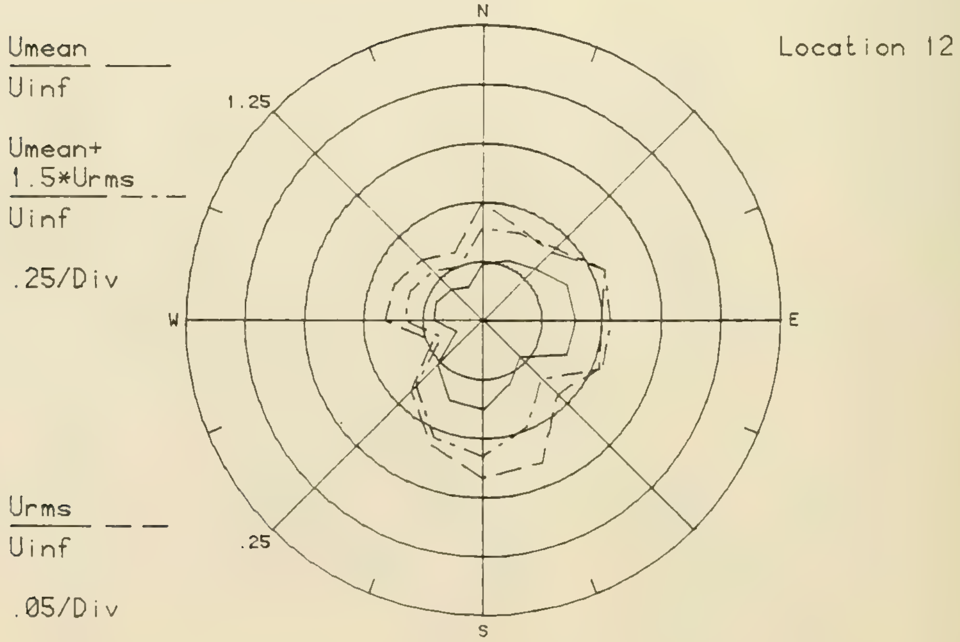
Configuration PH 2



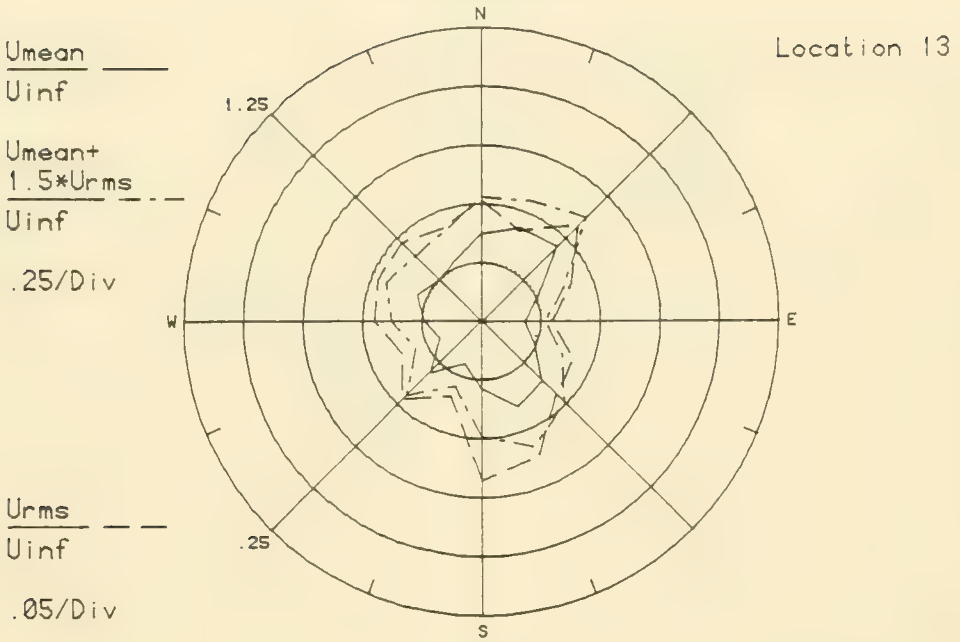


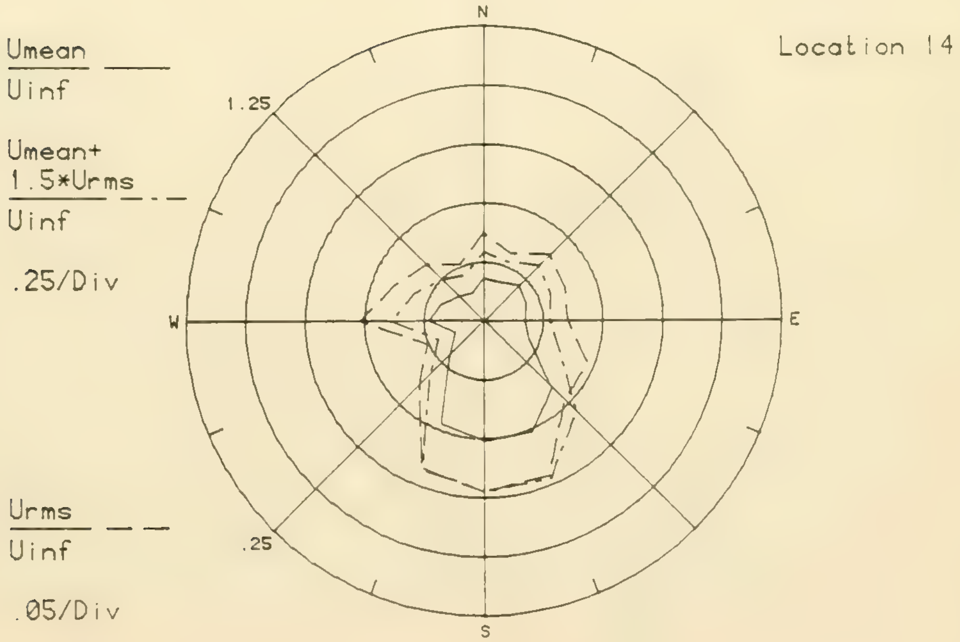
Configuration PH 2



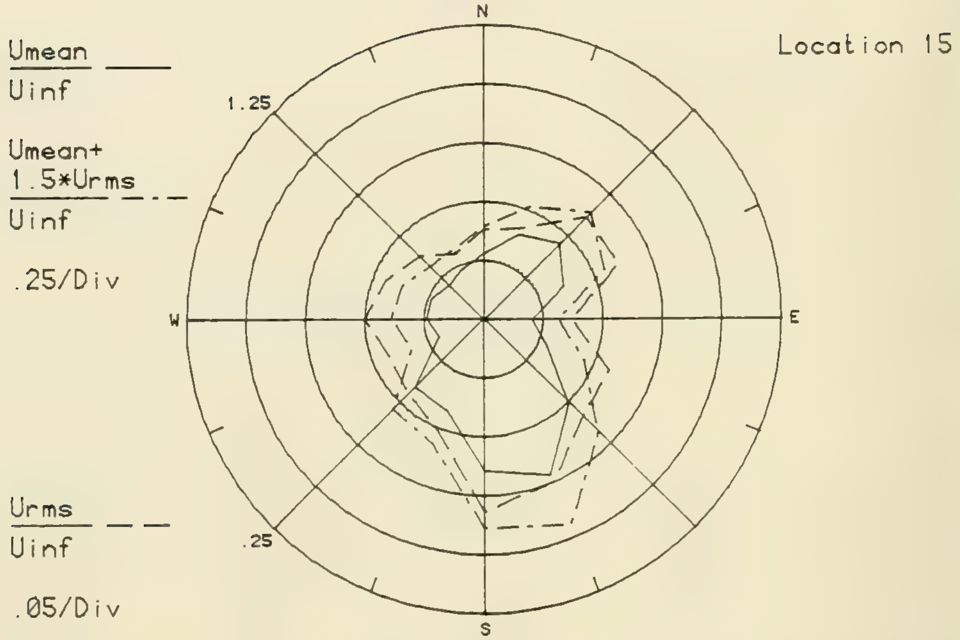


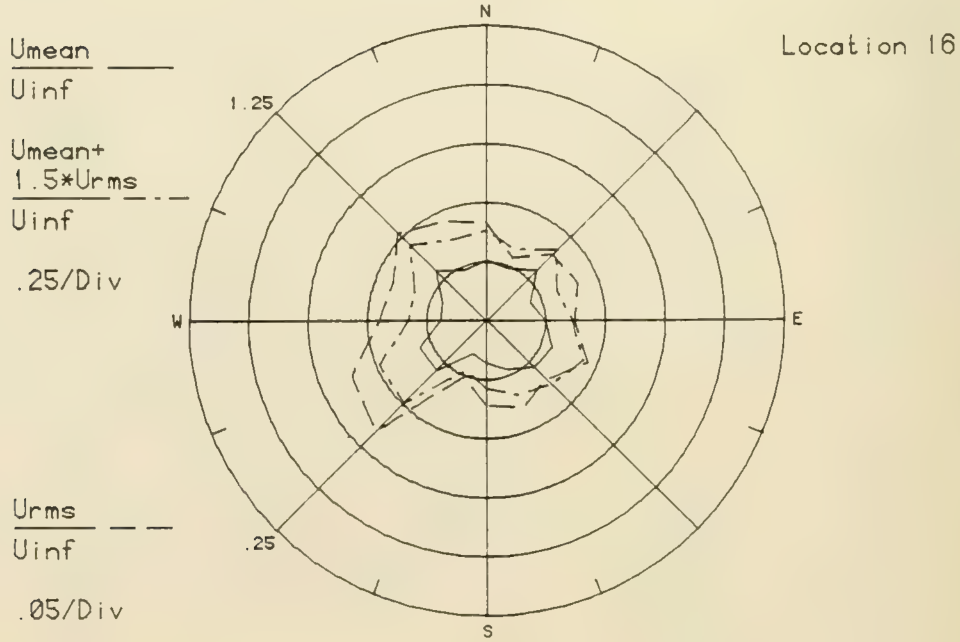
Configuration PH 2



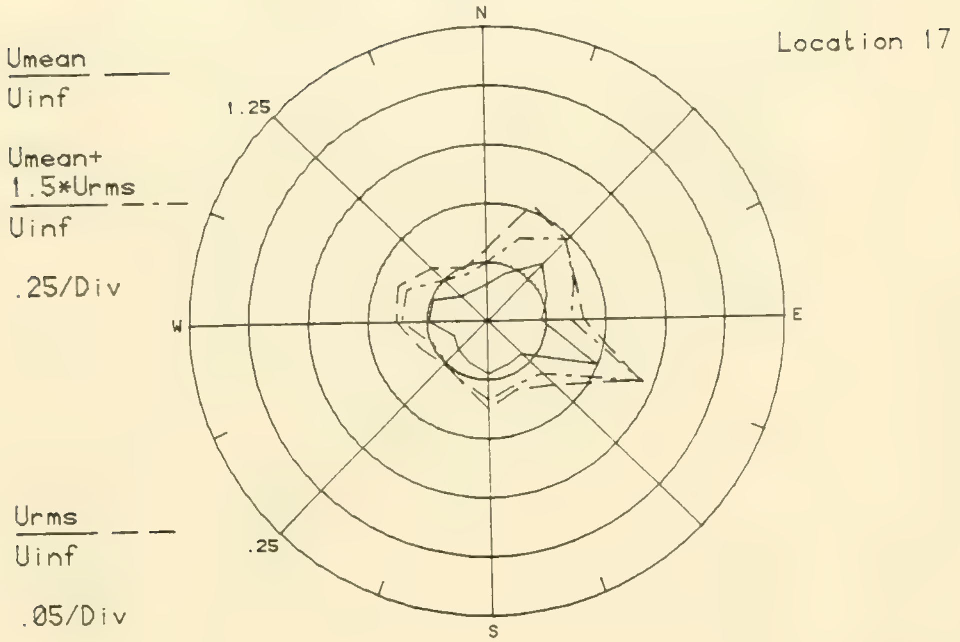


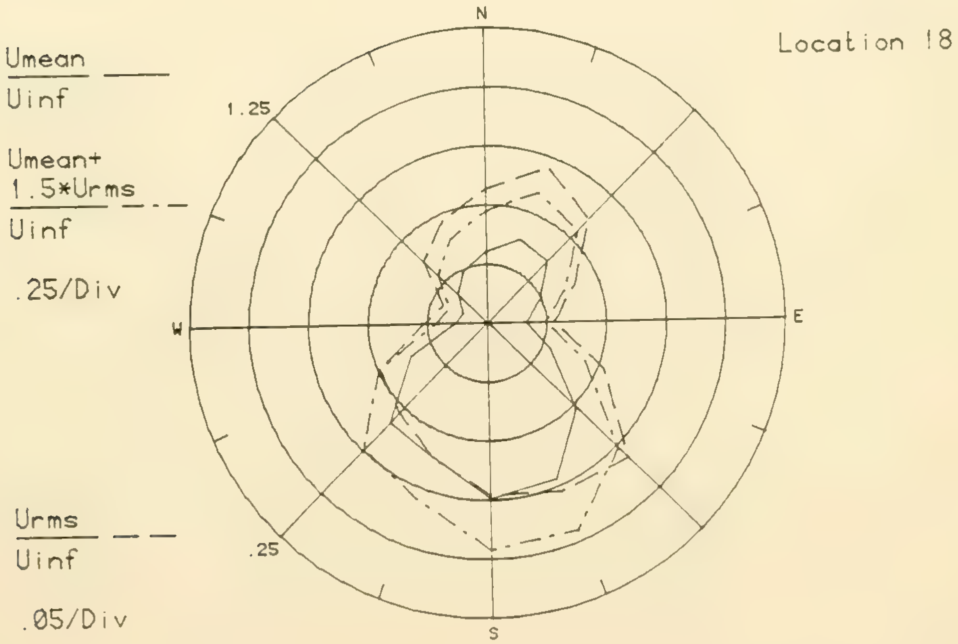
Configuration PH 2





Configuration PH 2





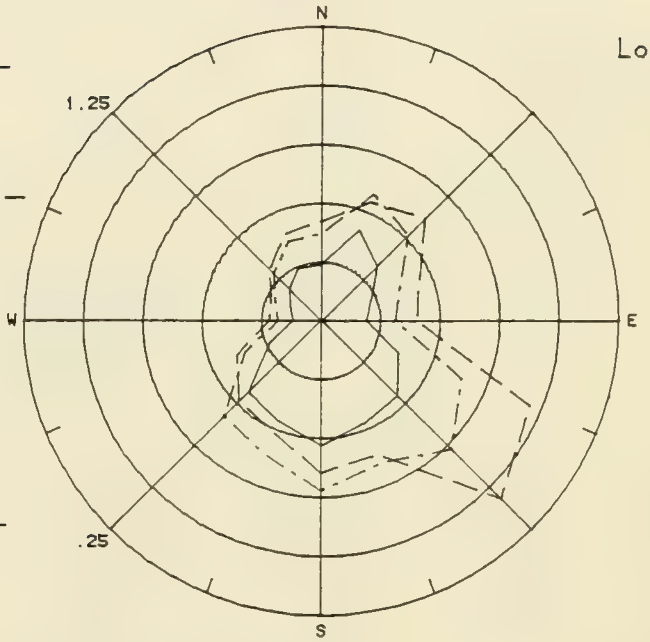
Configuration PH 2

Location 19

Umean / Uinf ———

Umean+ 1.5*Urms / Uinf —·—

.25/Div



Urms / Uinf — —

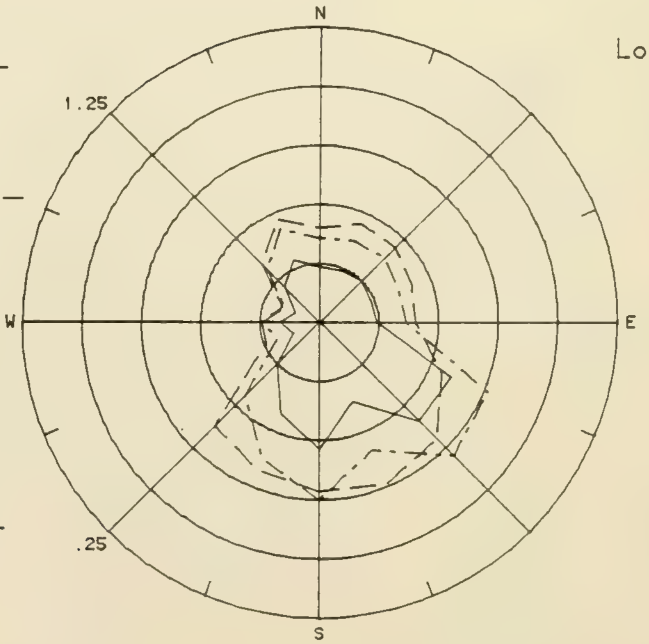
.05/Div

Location 20

Umean / Uinf ———

Umean+ 1.5*Urms / Uinf —·—

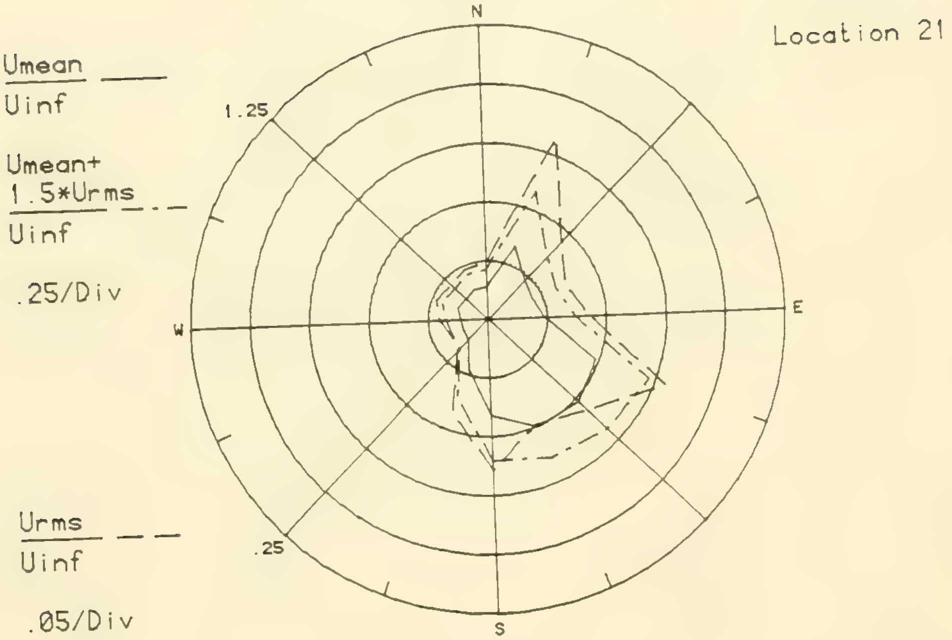
.25/Div

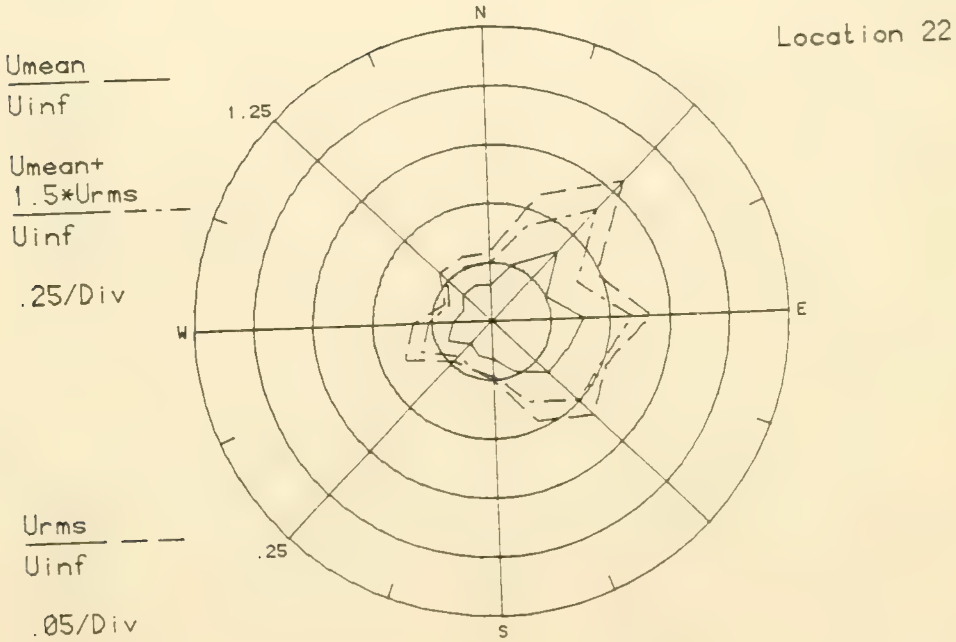


Urms / Uinf — —

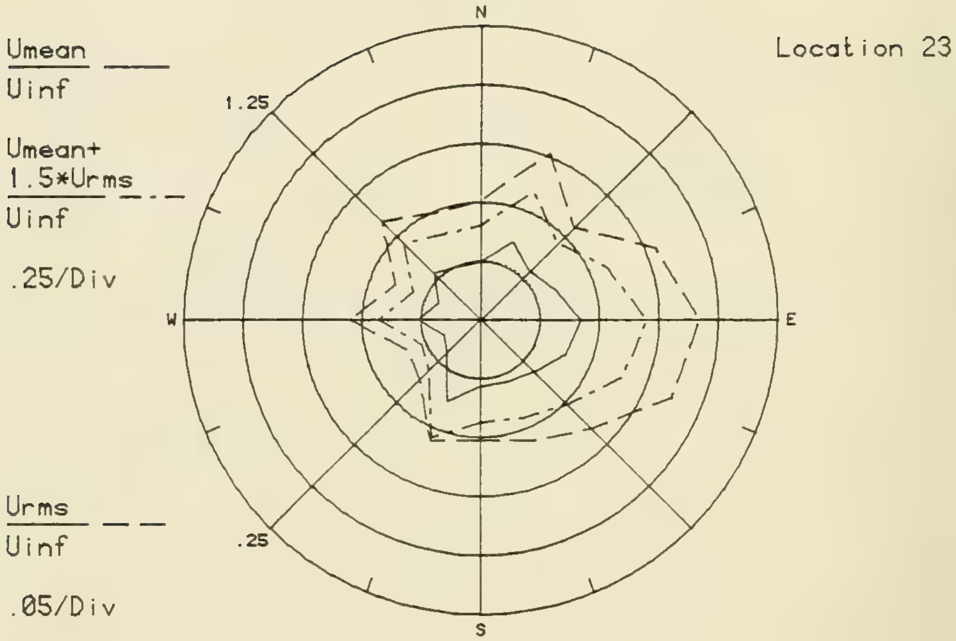
.05/Div

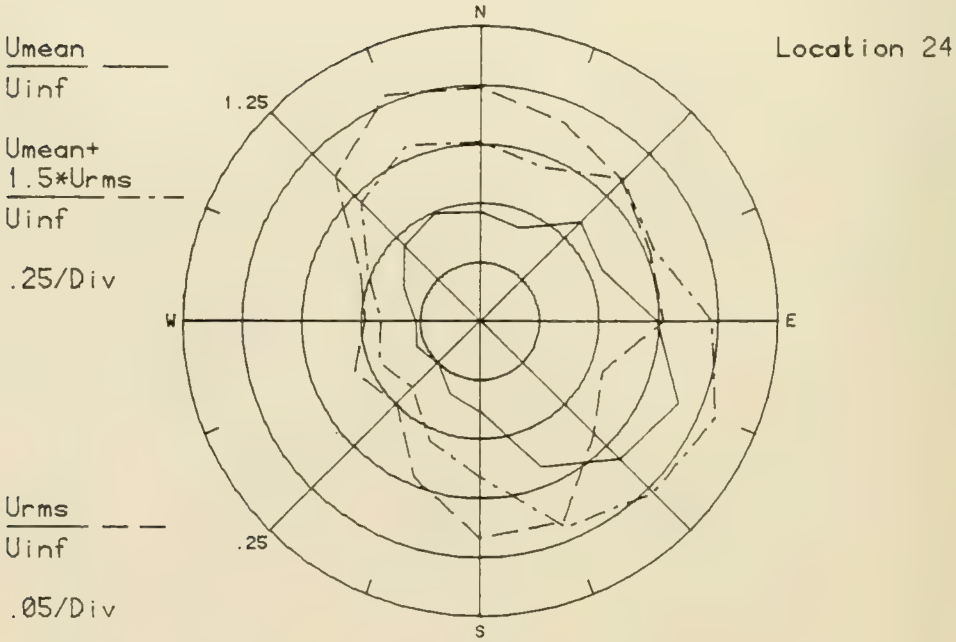
Configuration PH 2



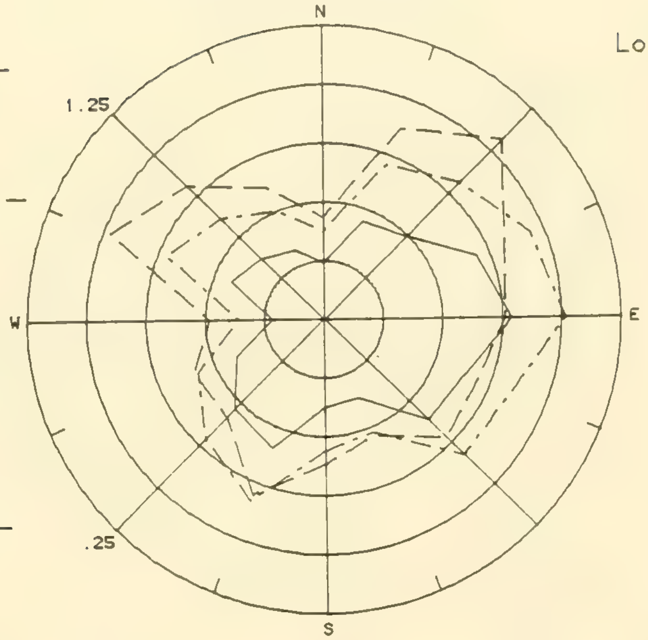


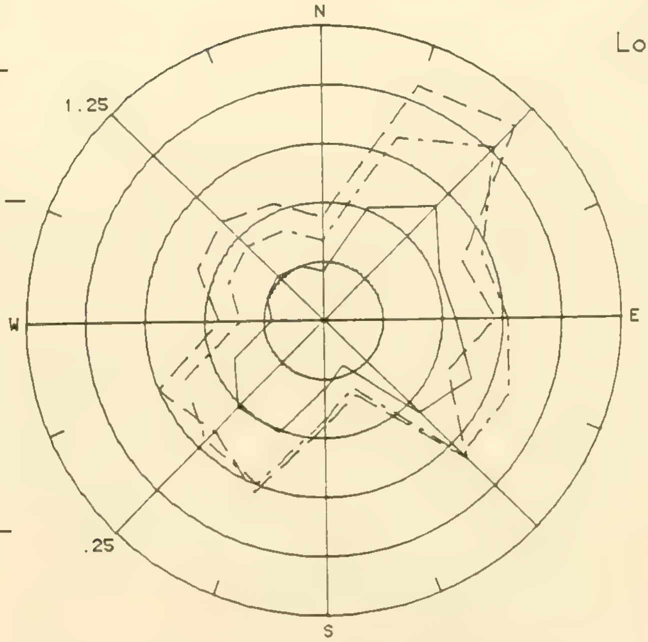
Configuration PH 2



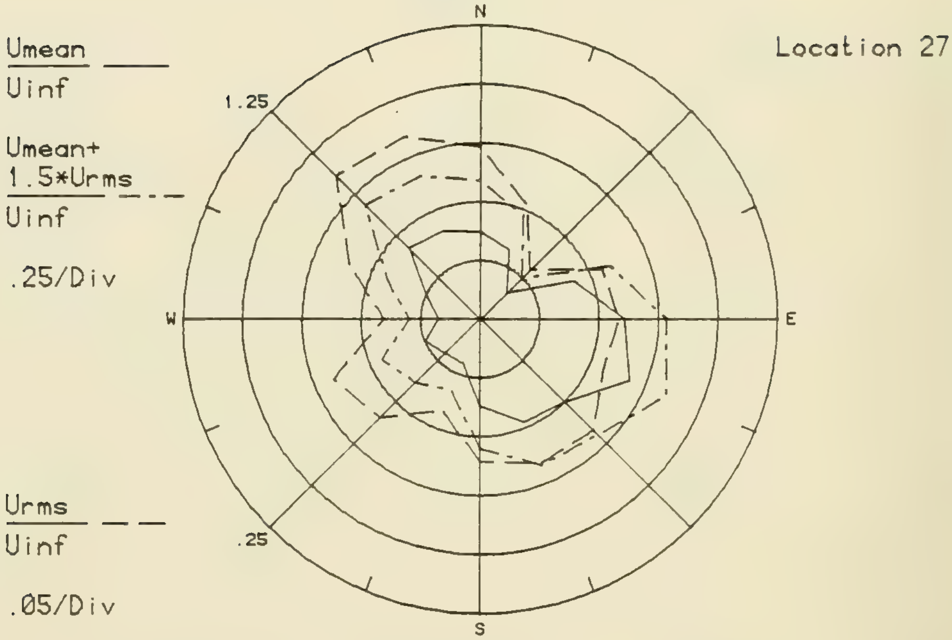


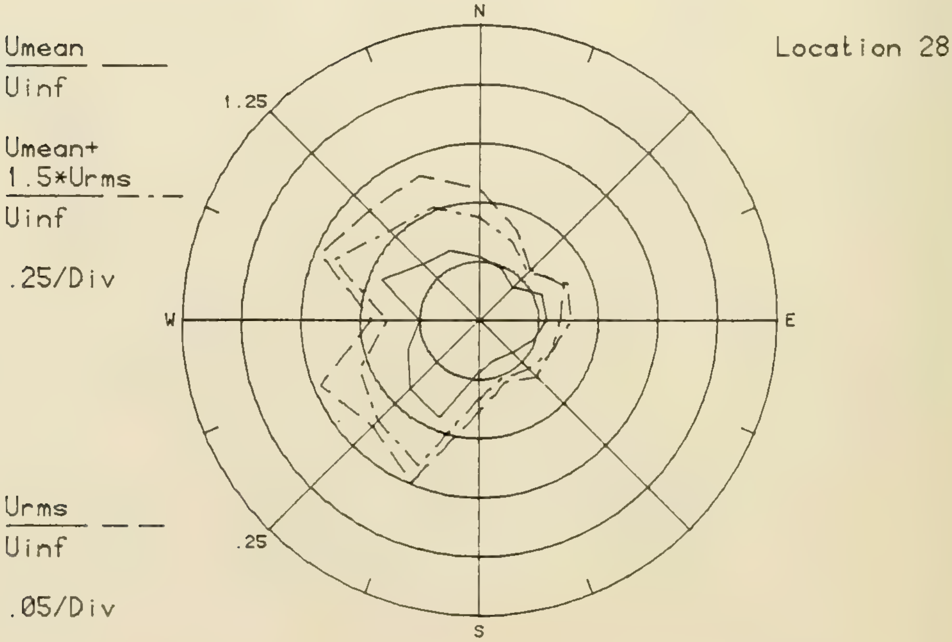
Configuration PH 2



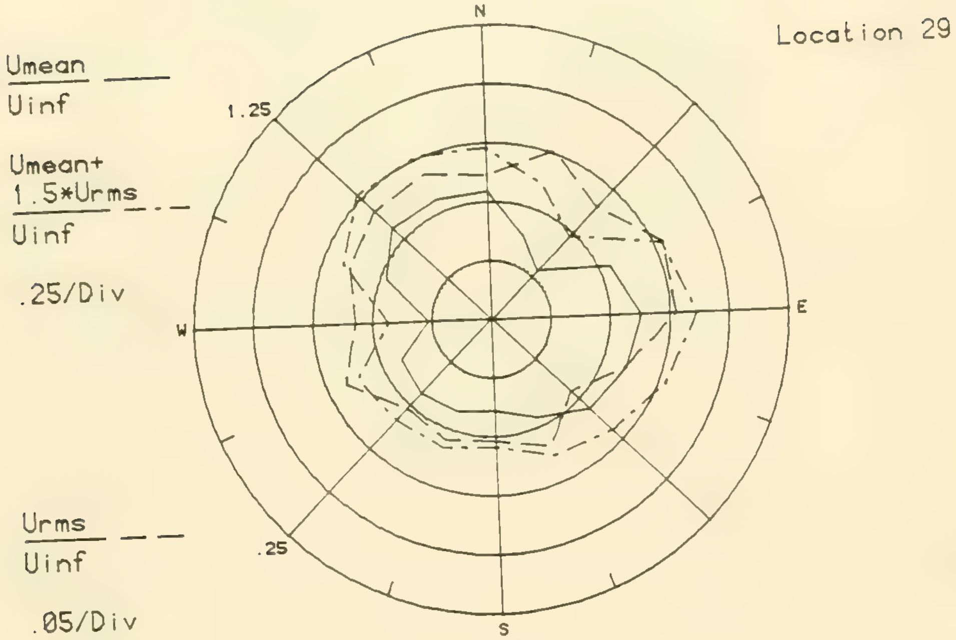


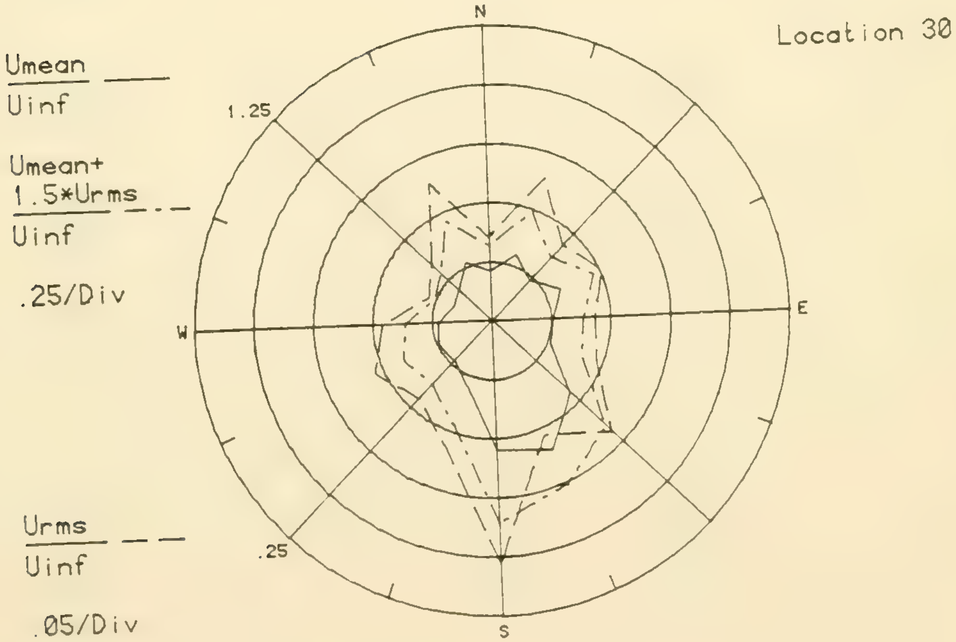
Configuration PH 2



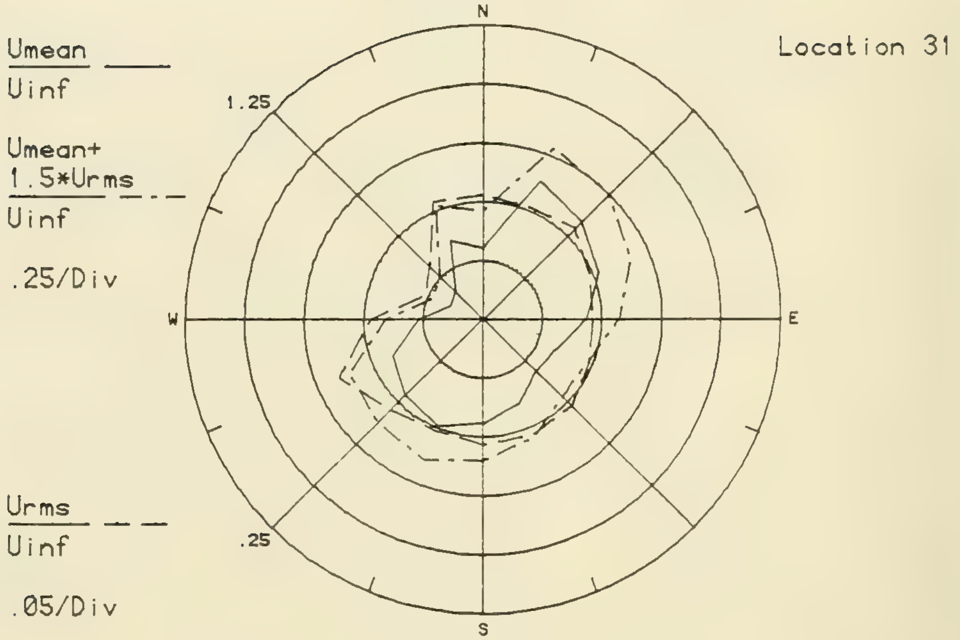


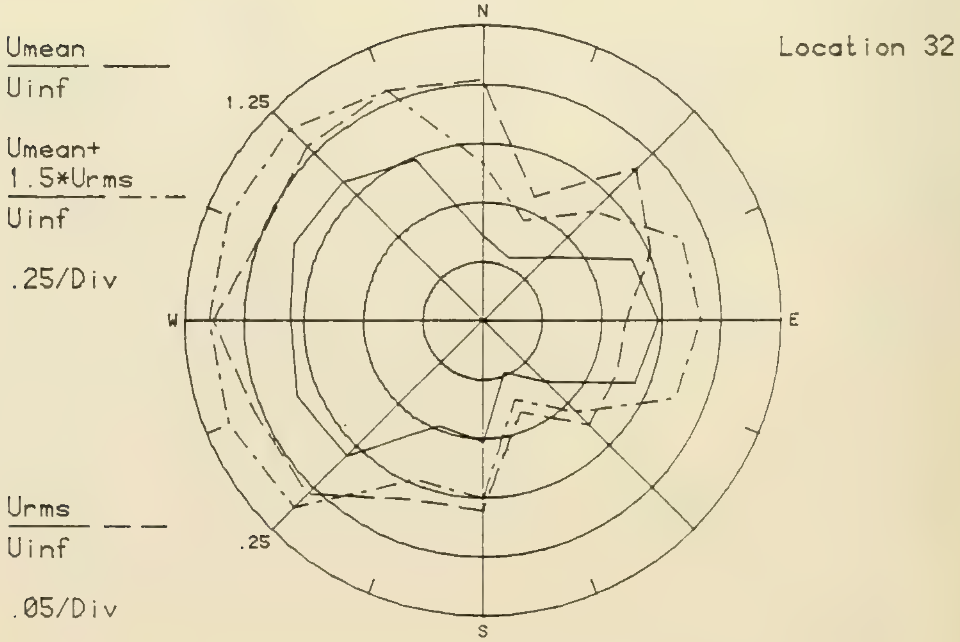
Configuration PH 2





Configuration PH 2





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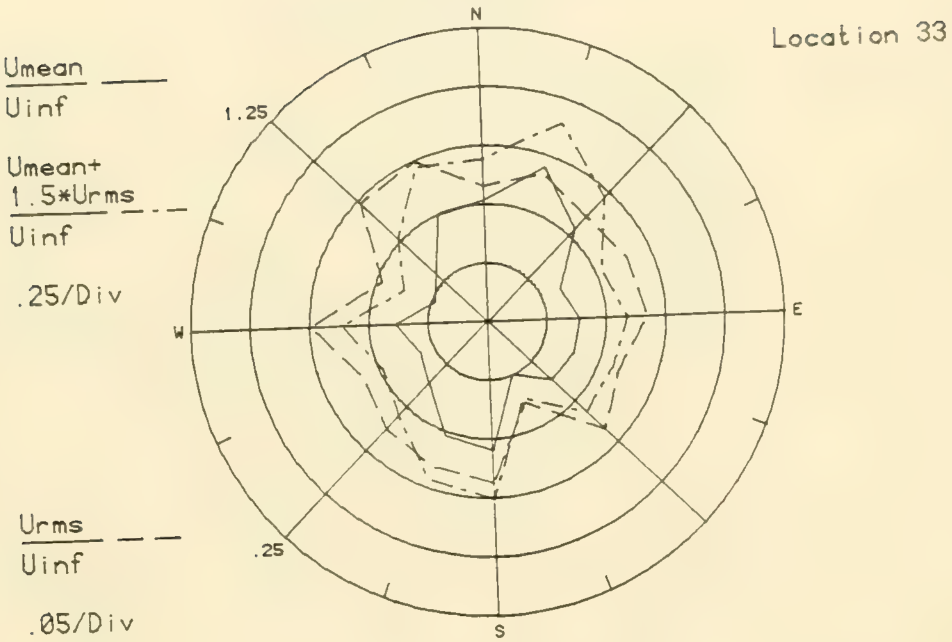

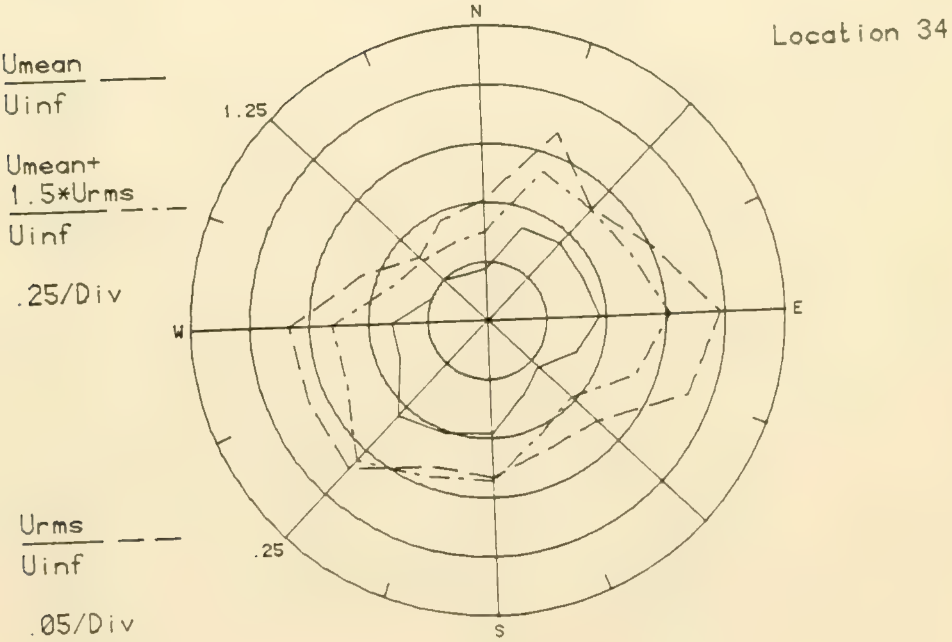

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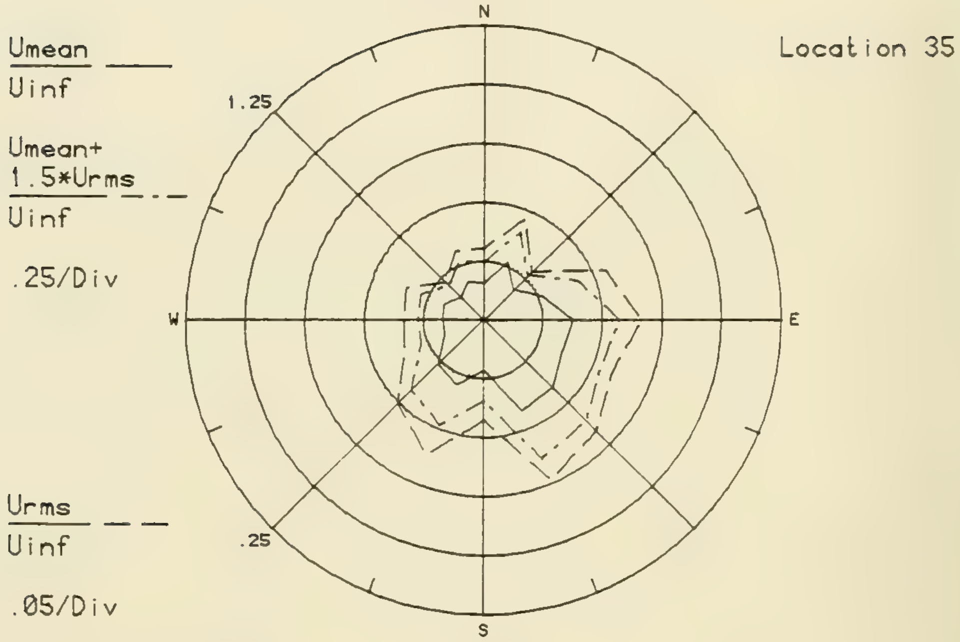
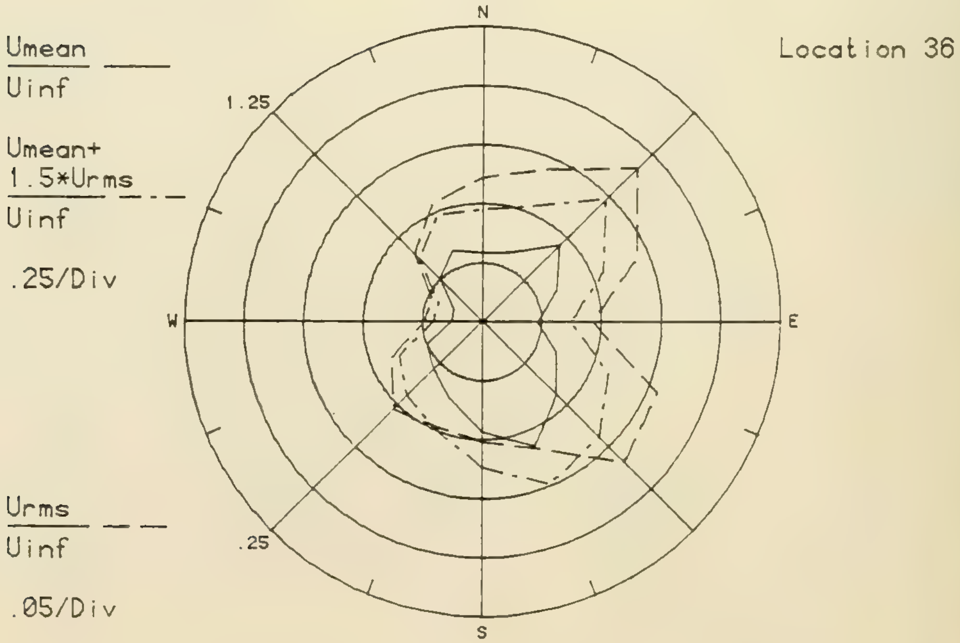
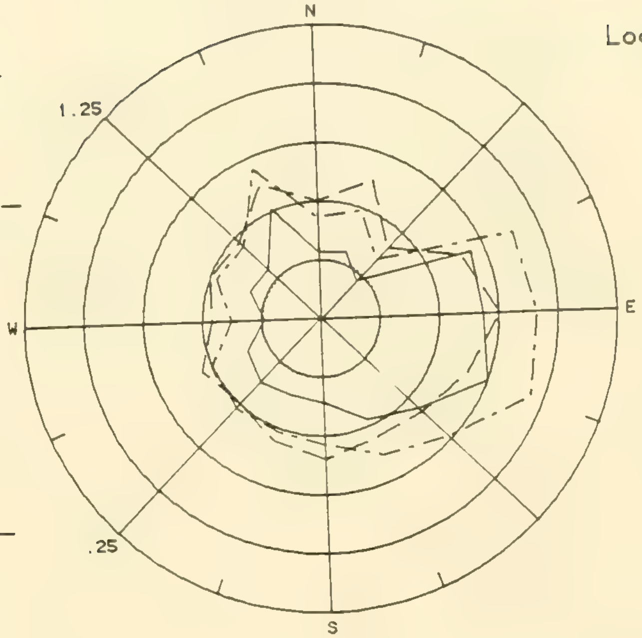




Configuration PH 2

Location 37



Umean / Uinf ———

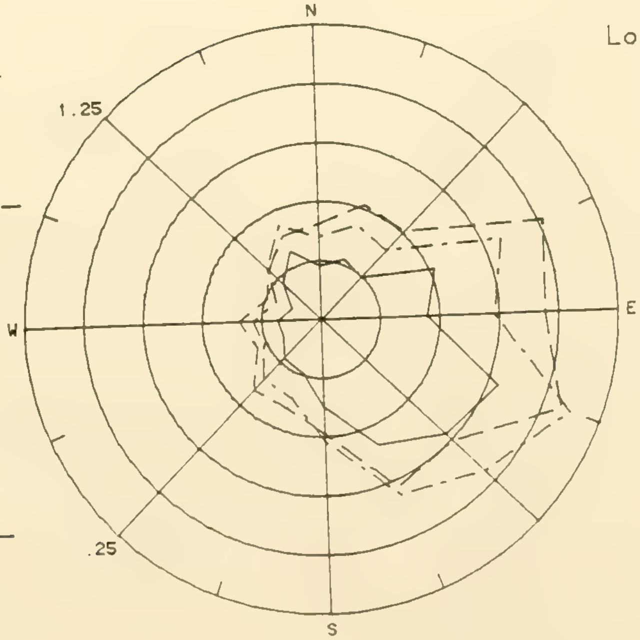
Umean+ 1.5*Urms / Uinf — · —

.25/Div

Urms / Uinf — —

.05/Div

Location 38



Umean / Uinf ———

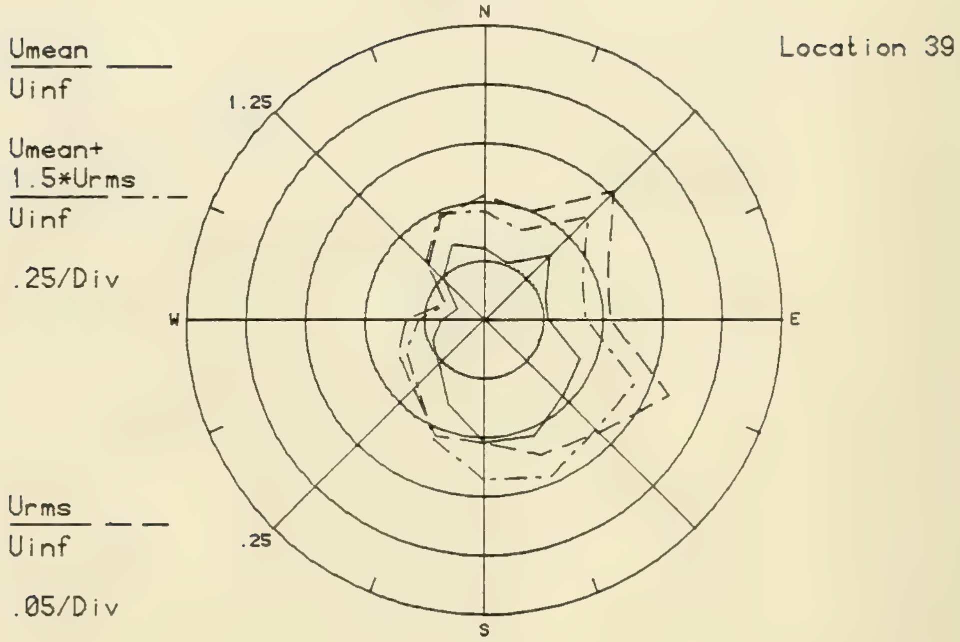
Umean+ 1.5*Urms / Uinf — · —

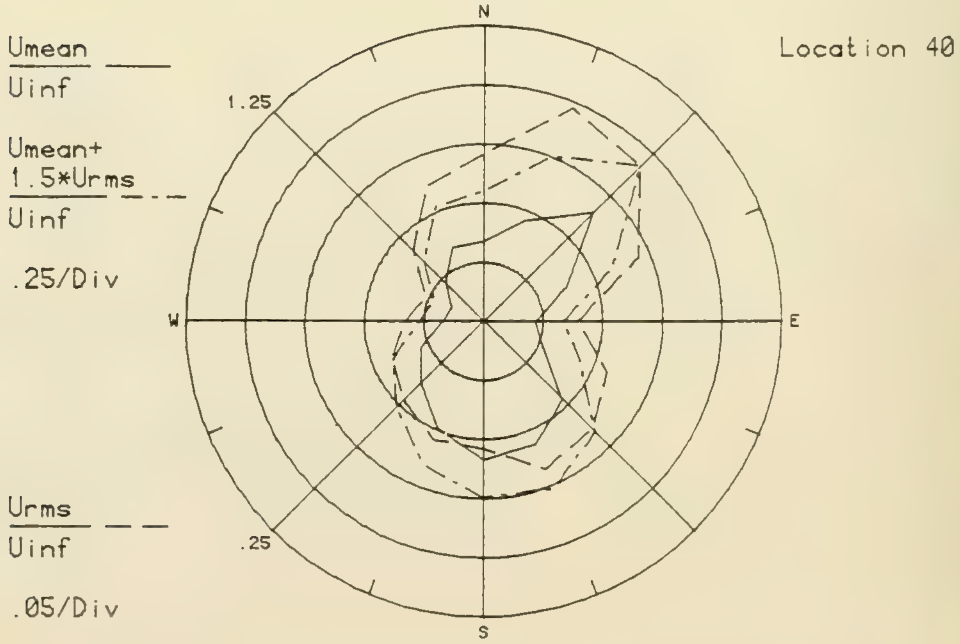
.25/Div

Urms / Uinf — —

.05/Div

Configuration PH 2





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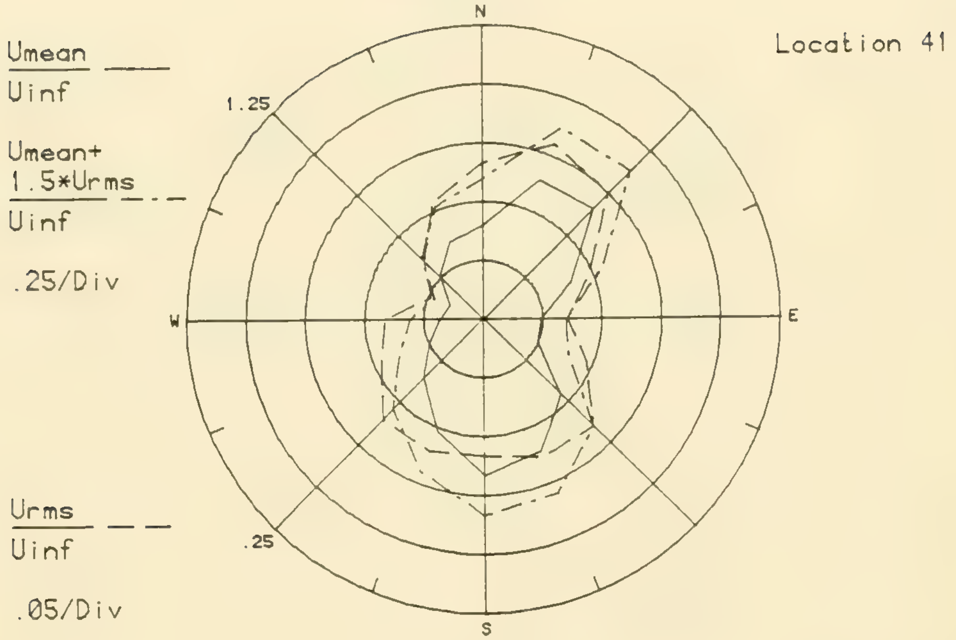

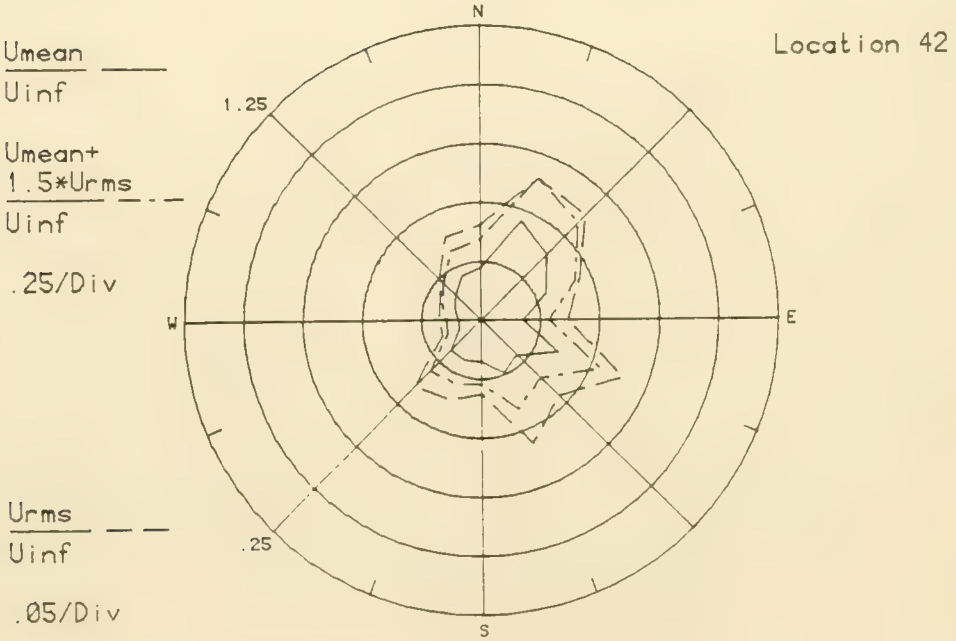

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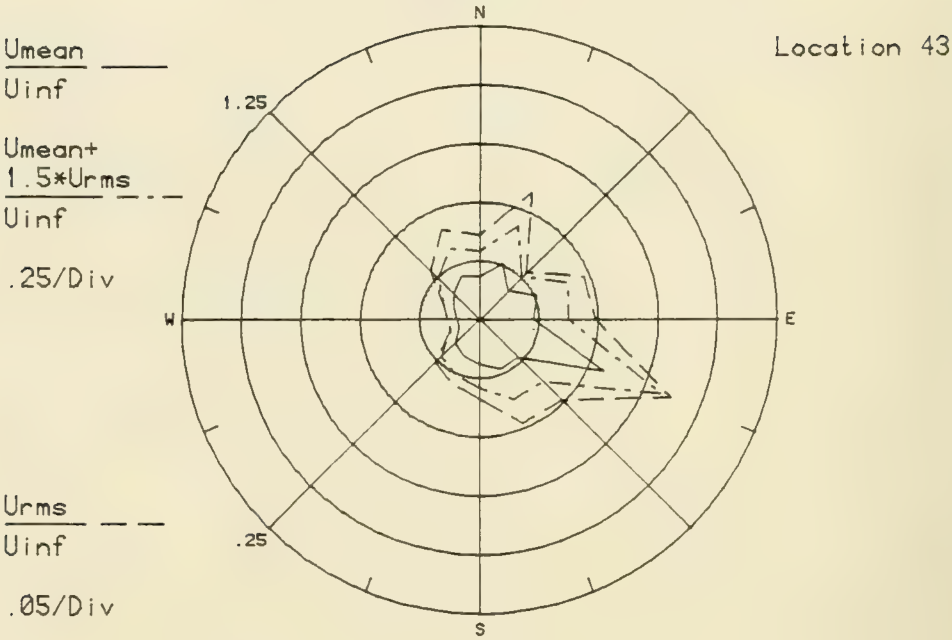

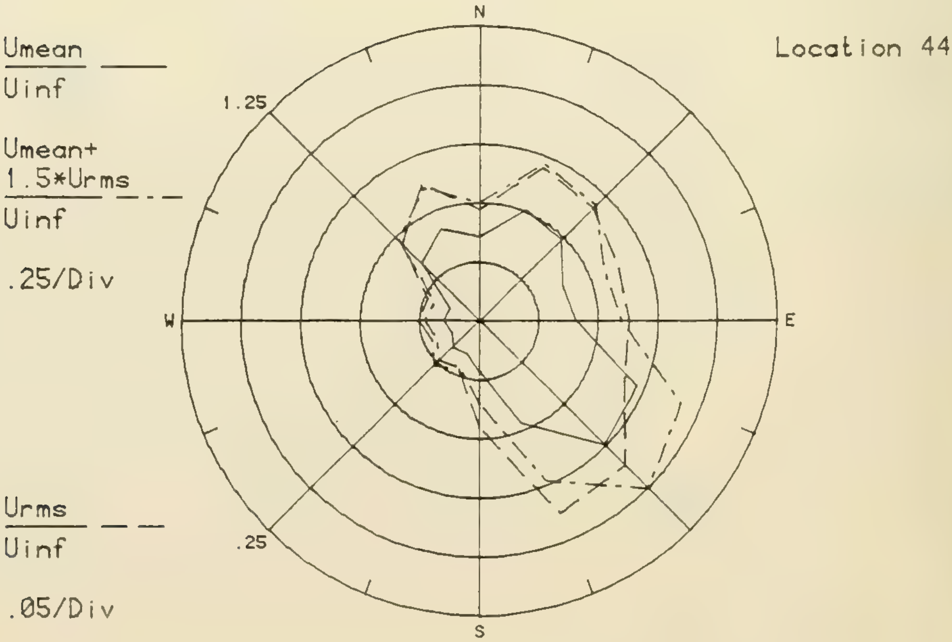

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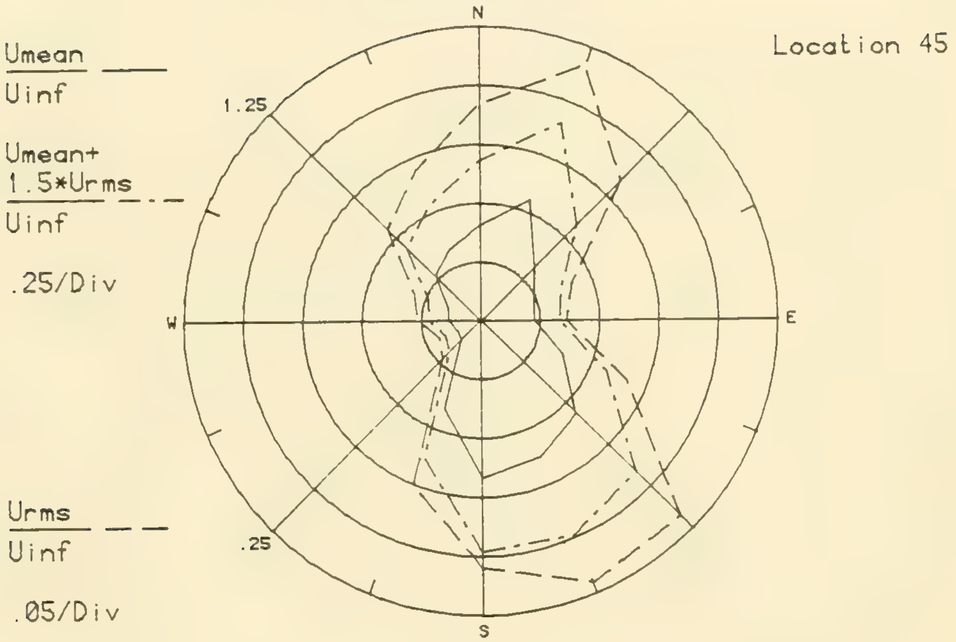
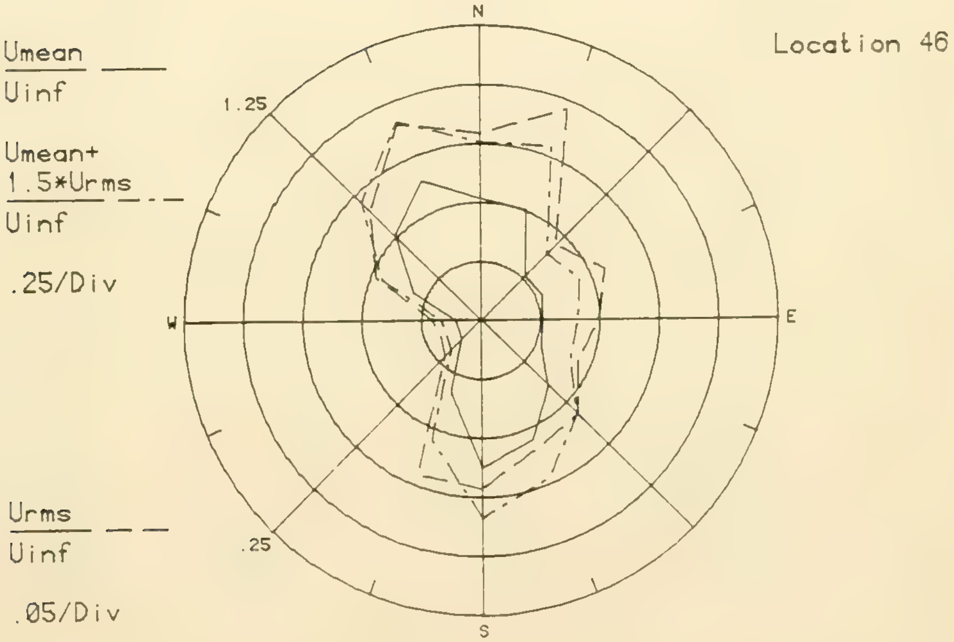
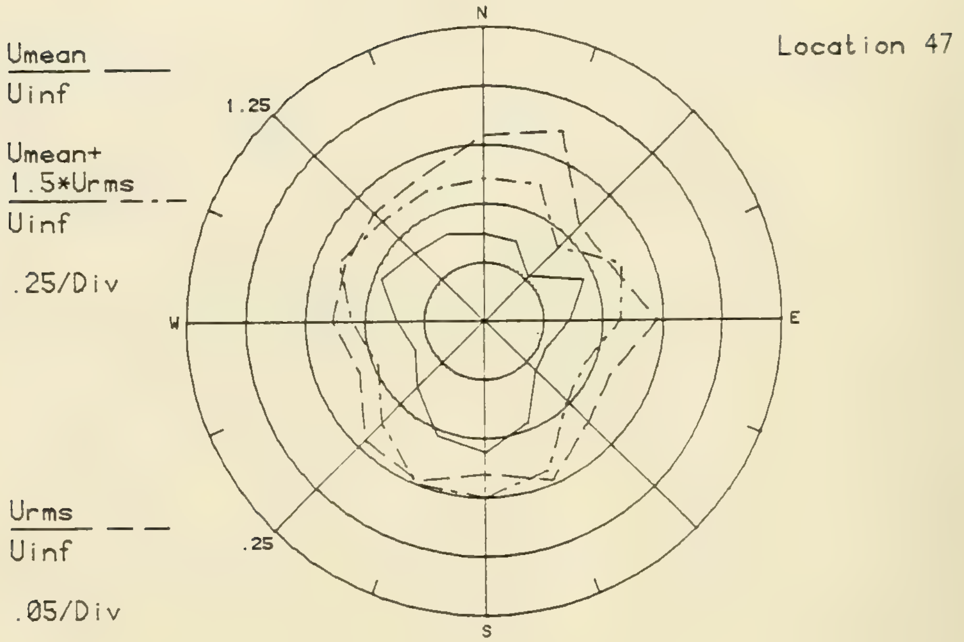




Configuration PH 2

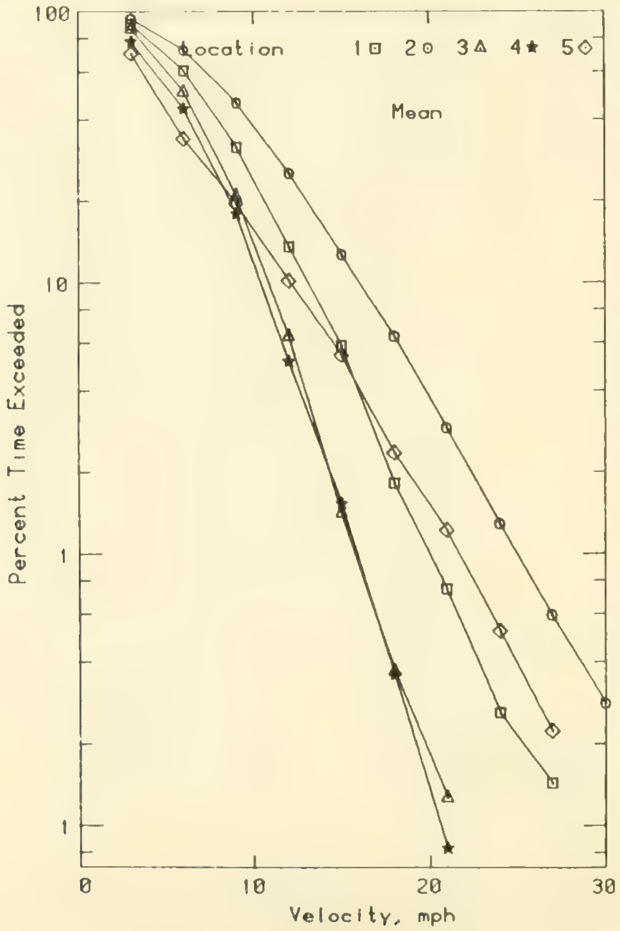


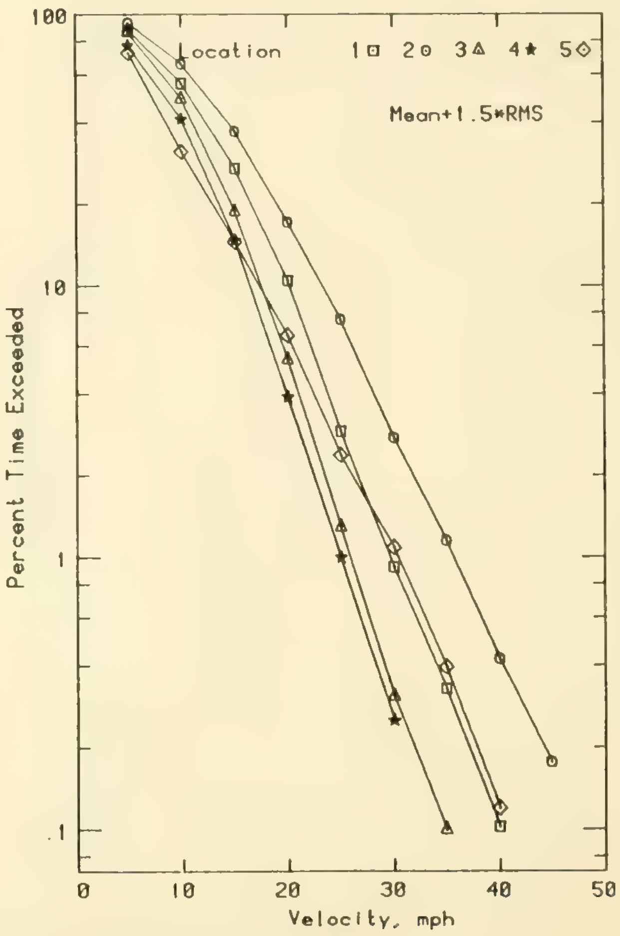
APPENDIX D

PERCENT TIME EXCEEDED PLOTS

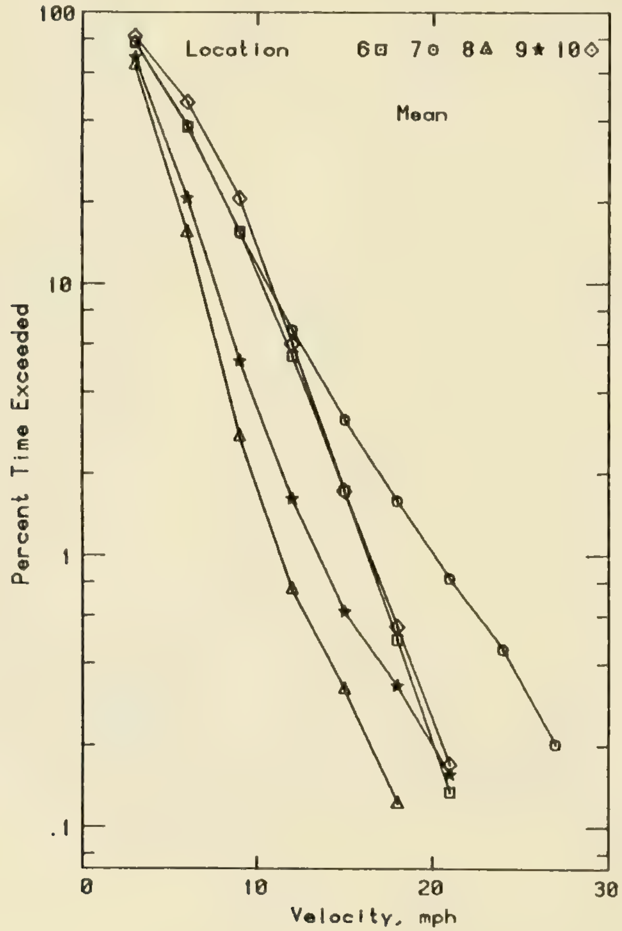
PERCENT TIME EXCEEDED PLOTS

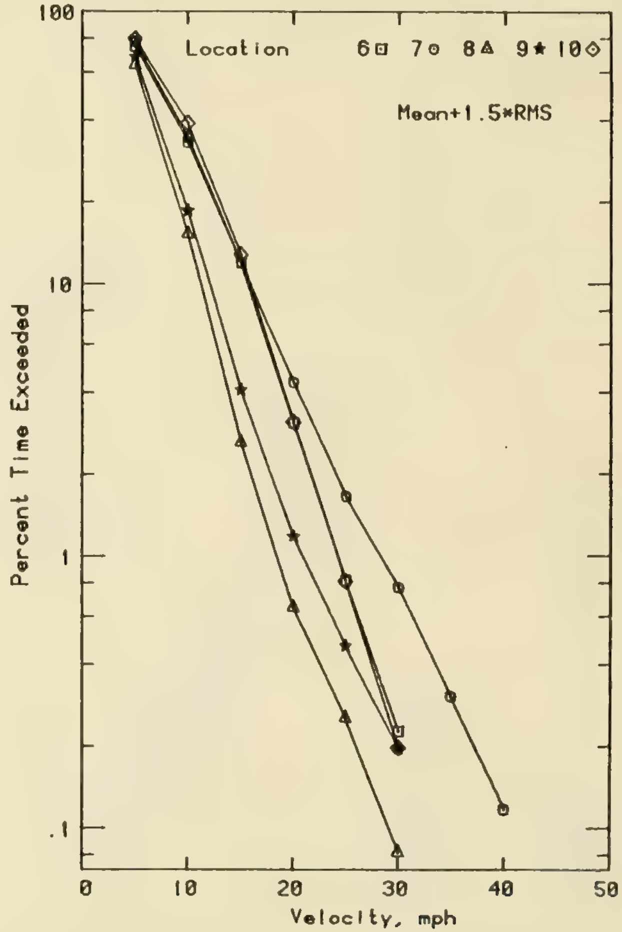
The graphs included in this appendix show the percent of time for which a given mean or gust velocity is exceeded for each pedestrian location for each configuration.



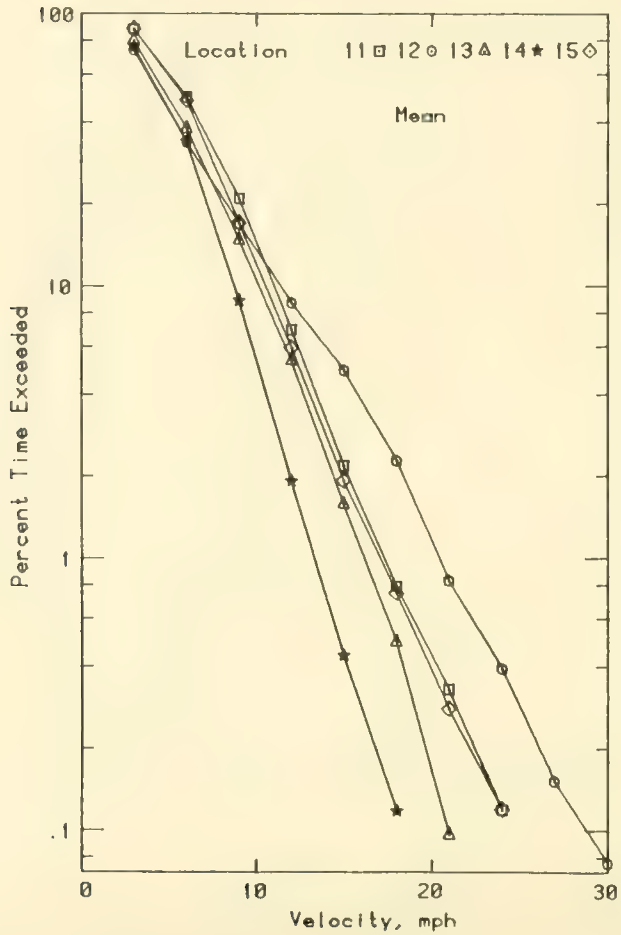


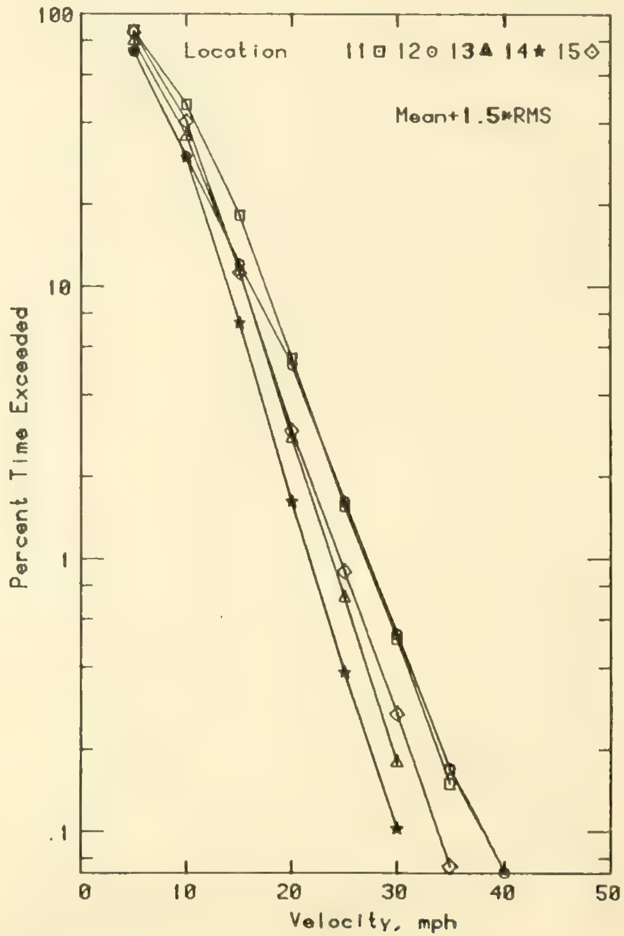
Percent Time Exceeded for PRE Configuration





Percent Time Exceeded for PRE Configuration





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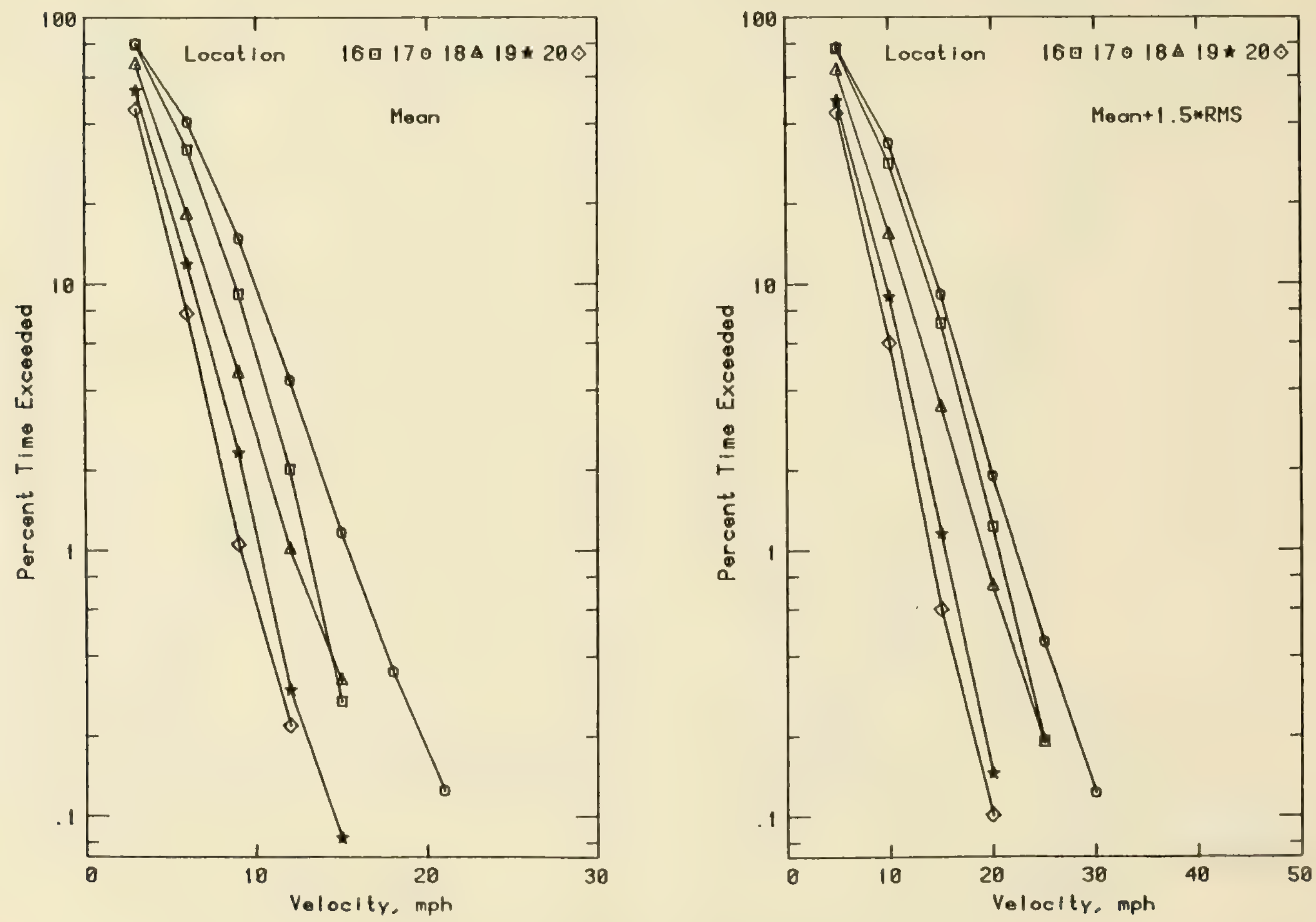

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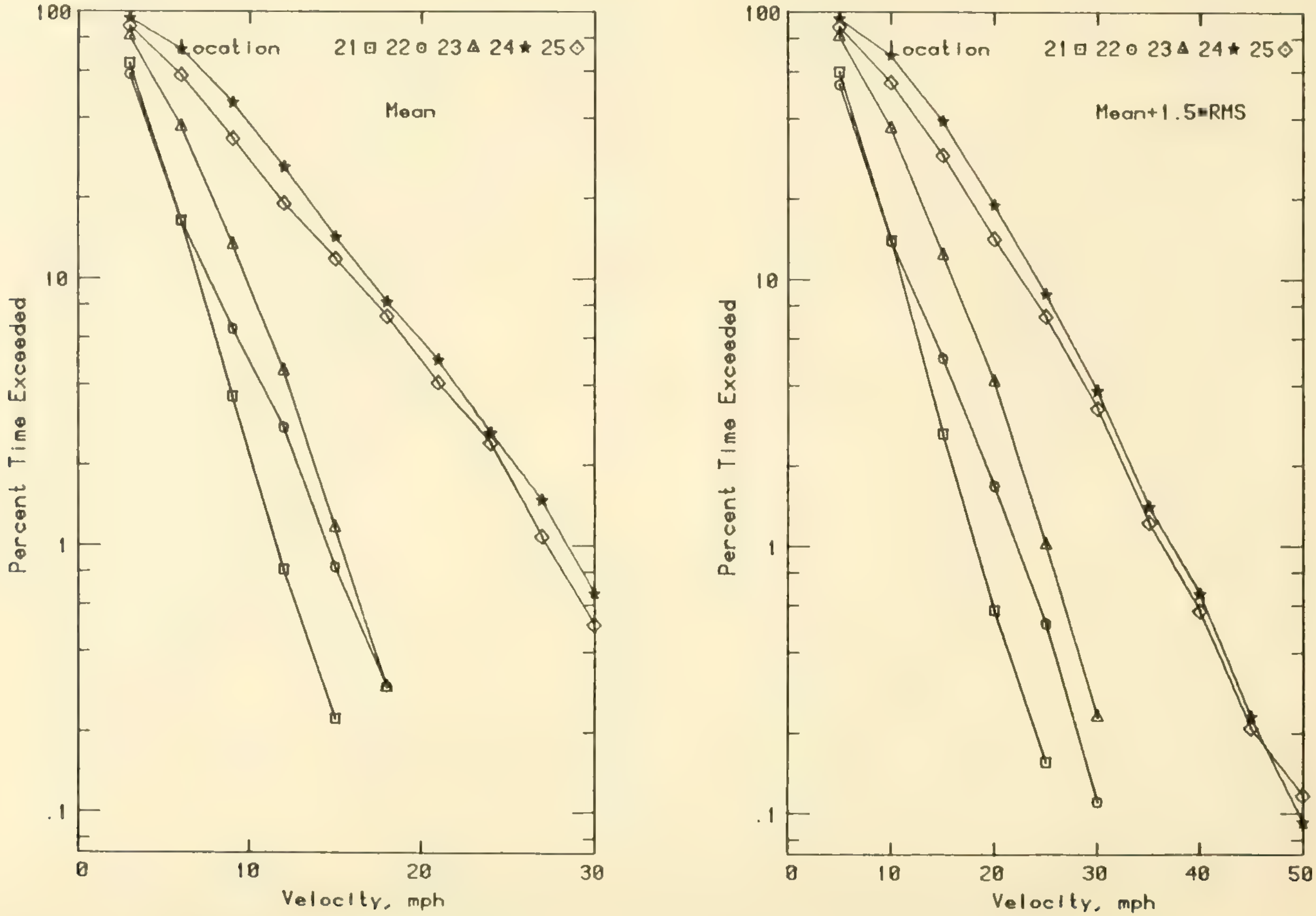

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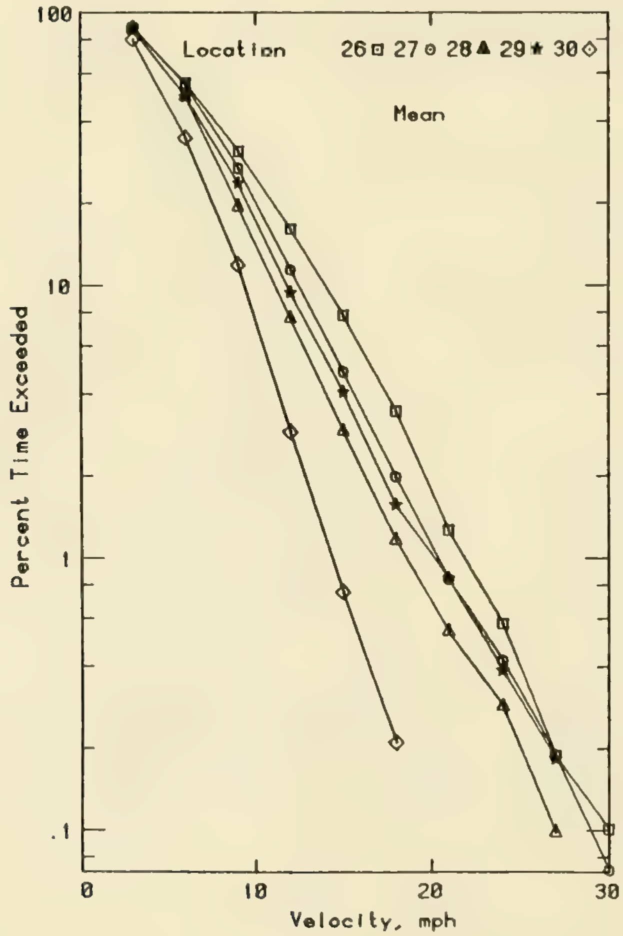

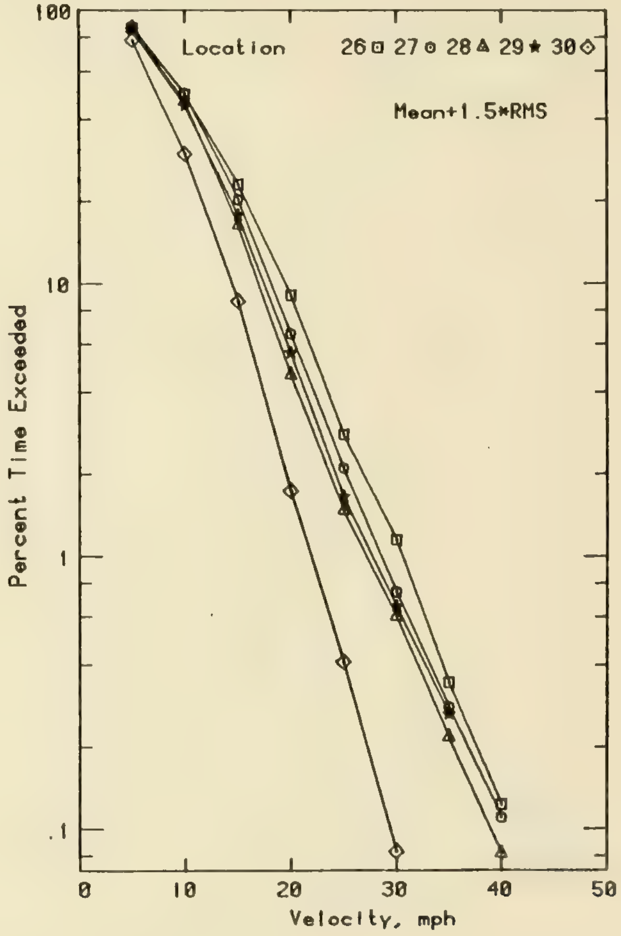

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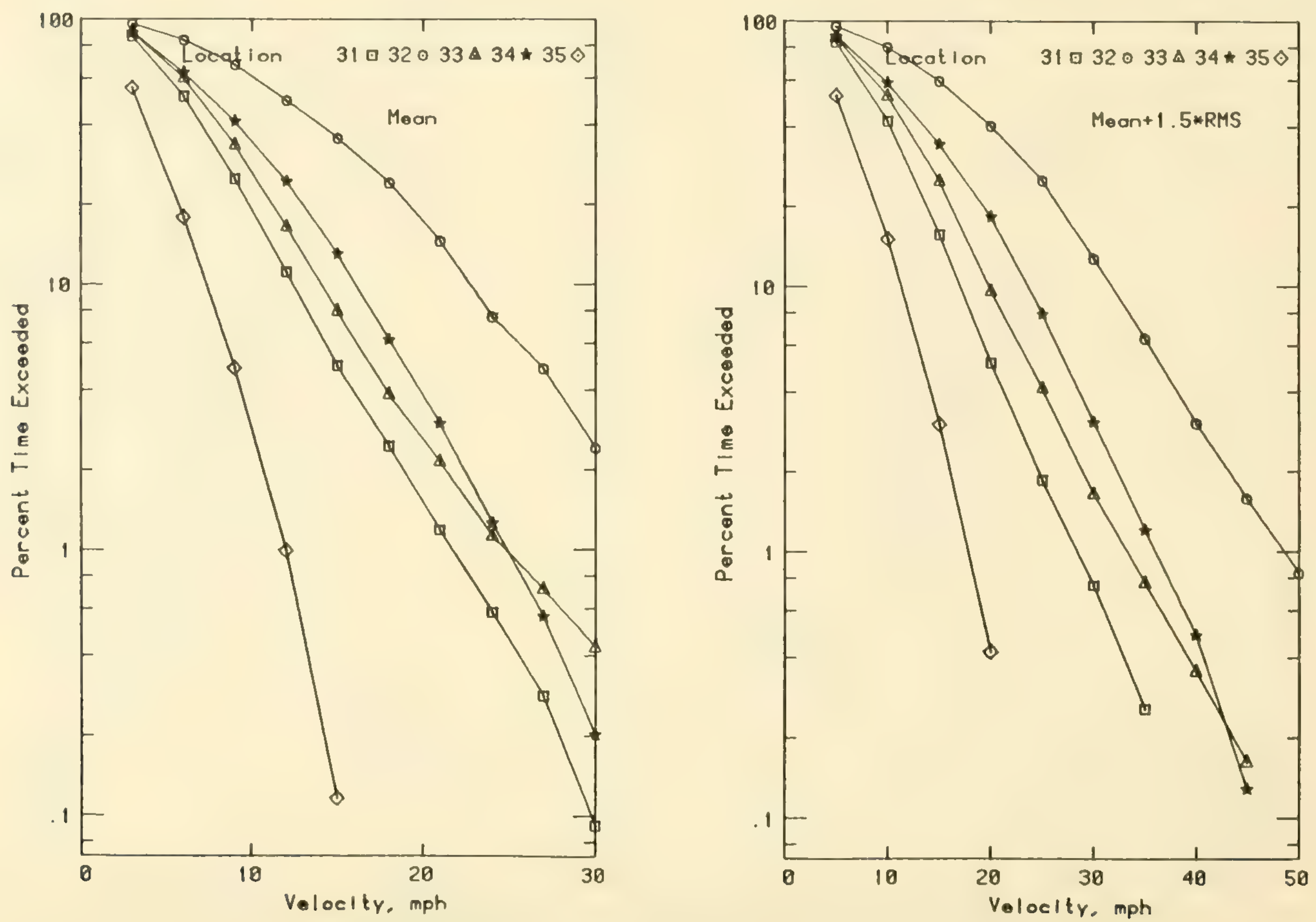

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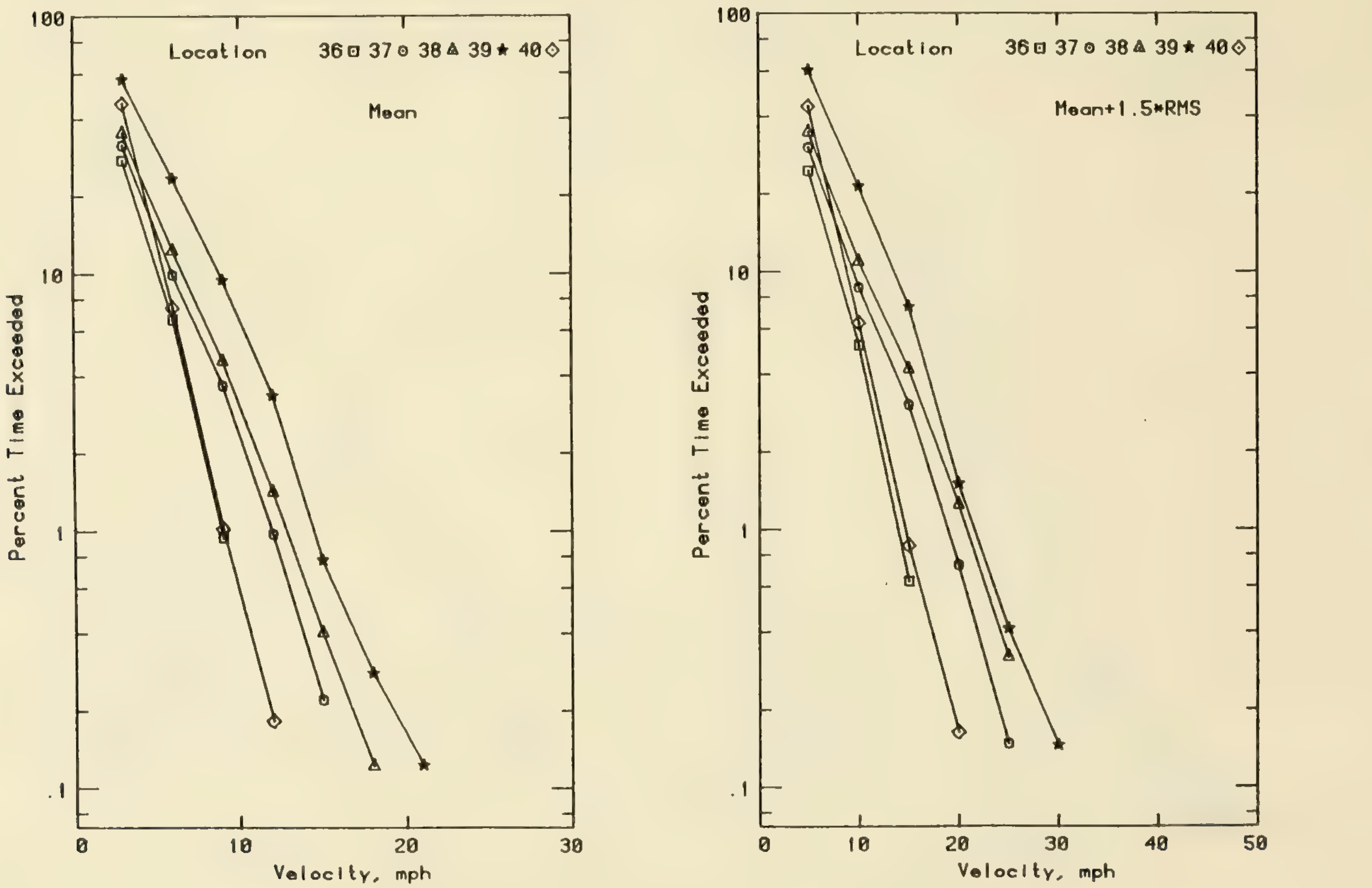

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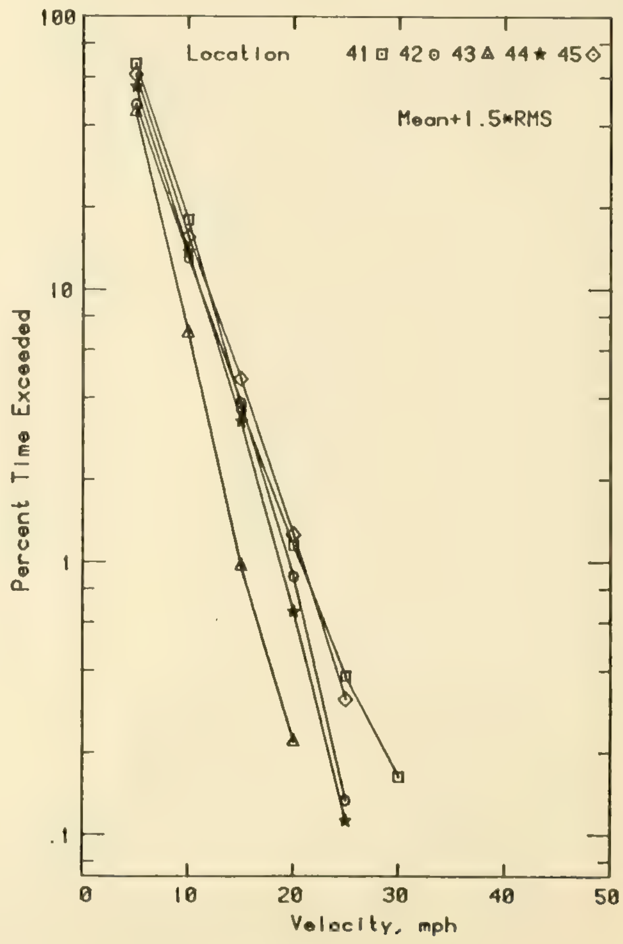

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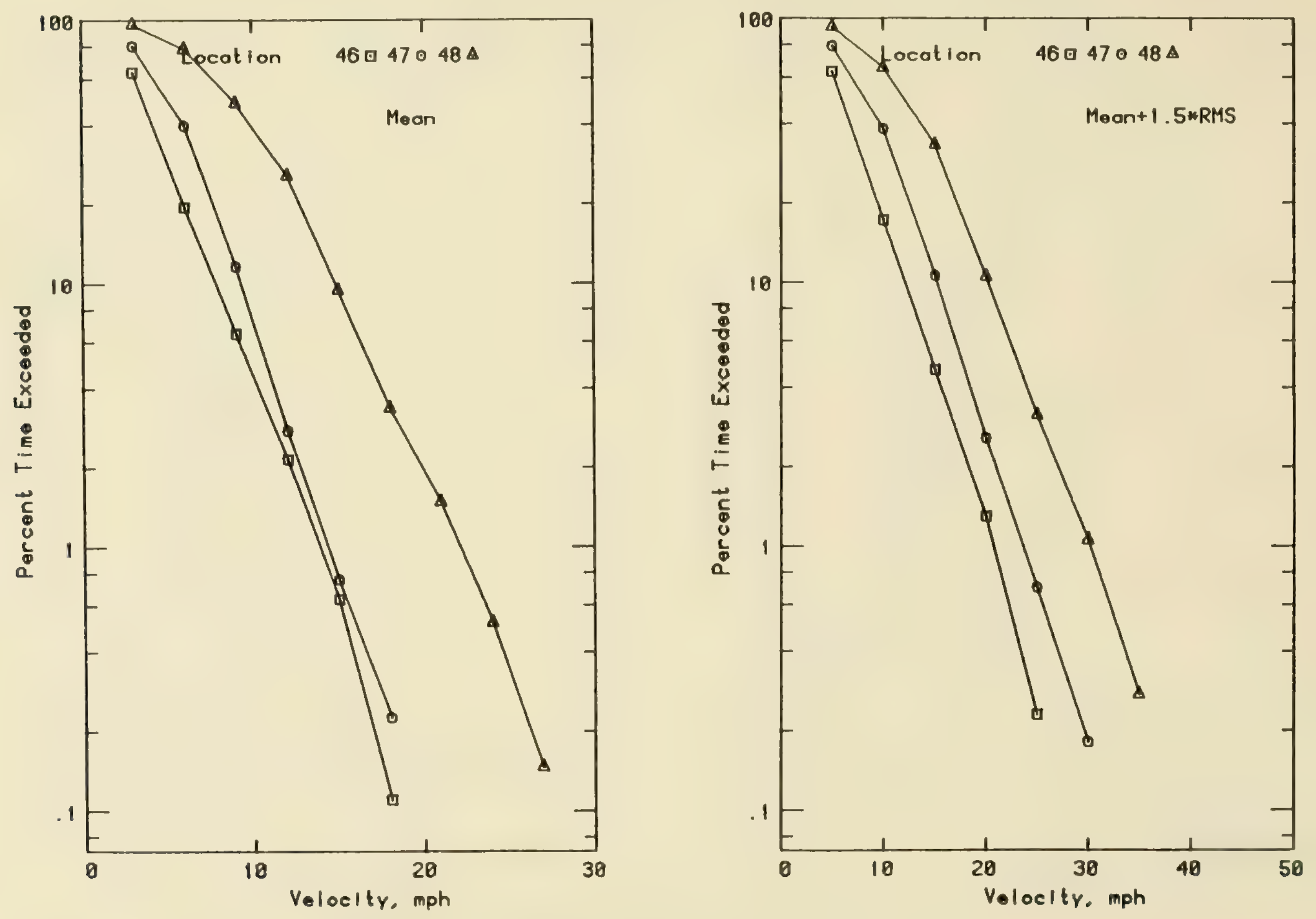

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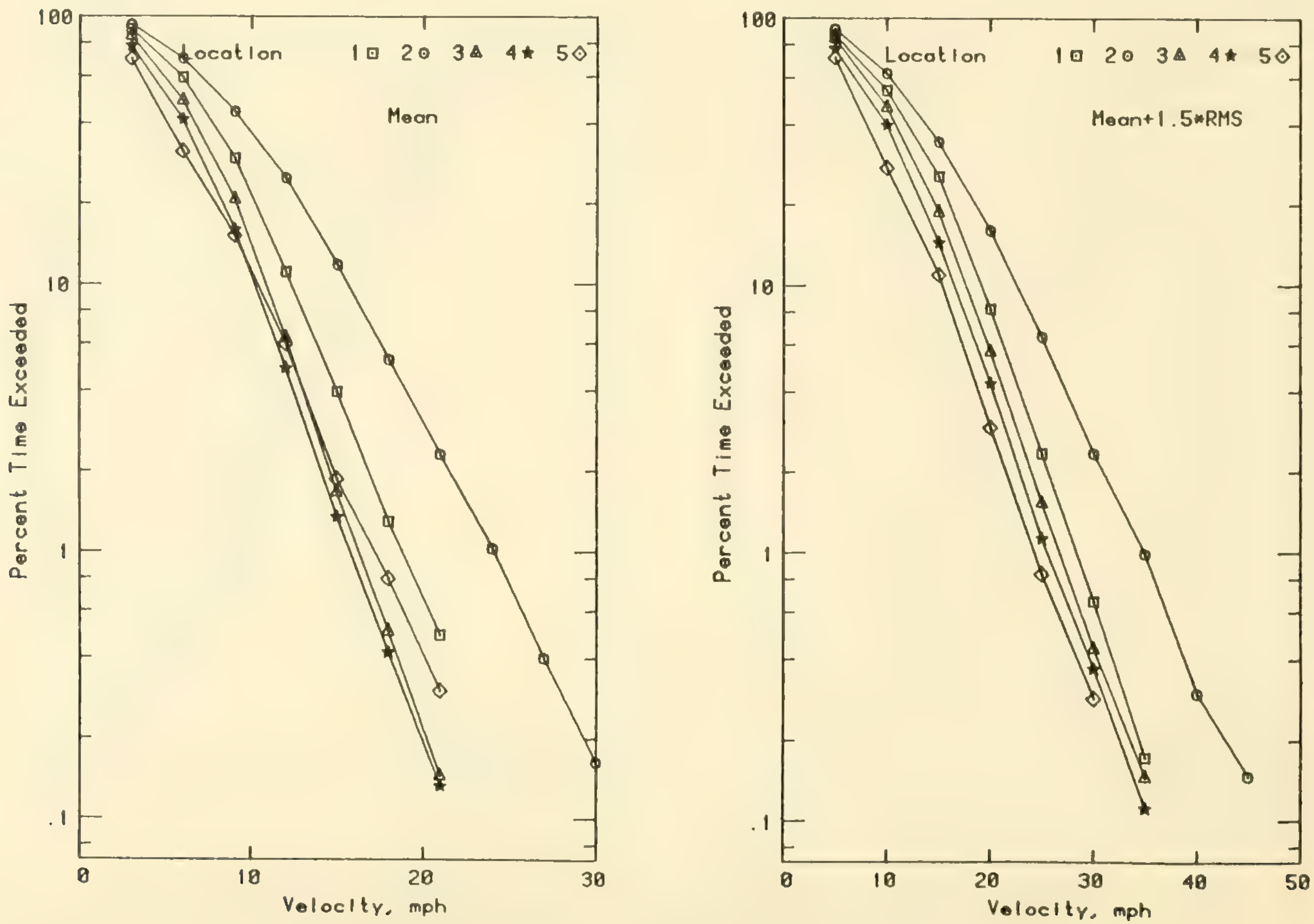
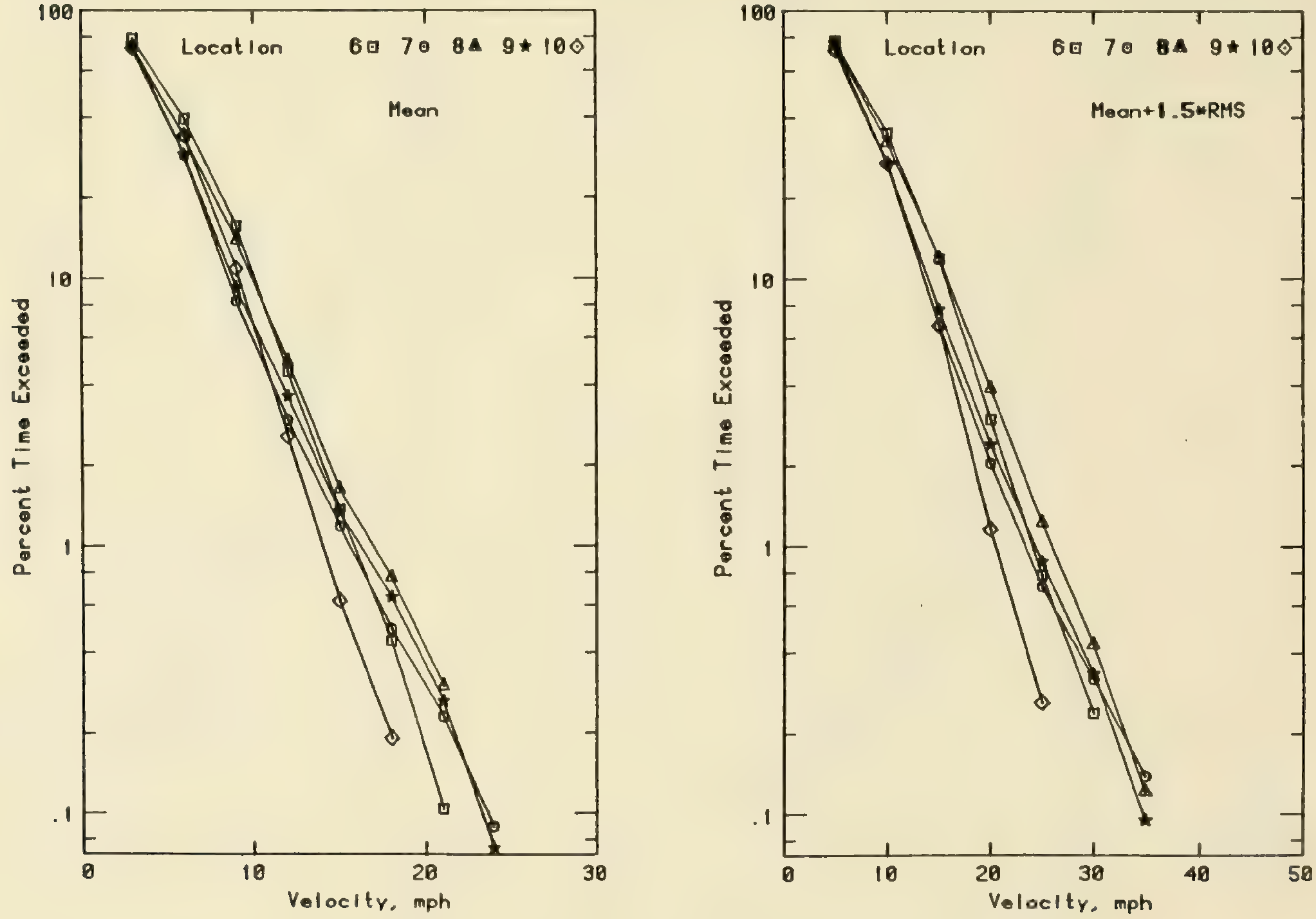
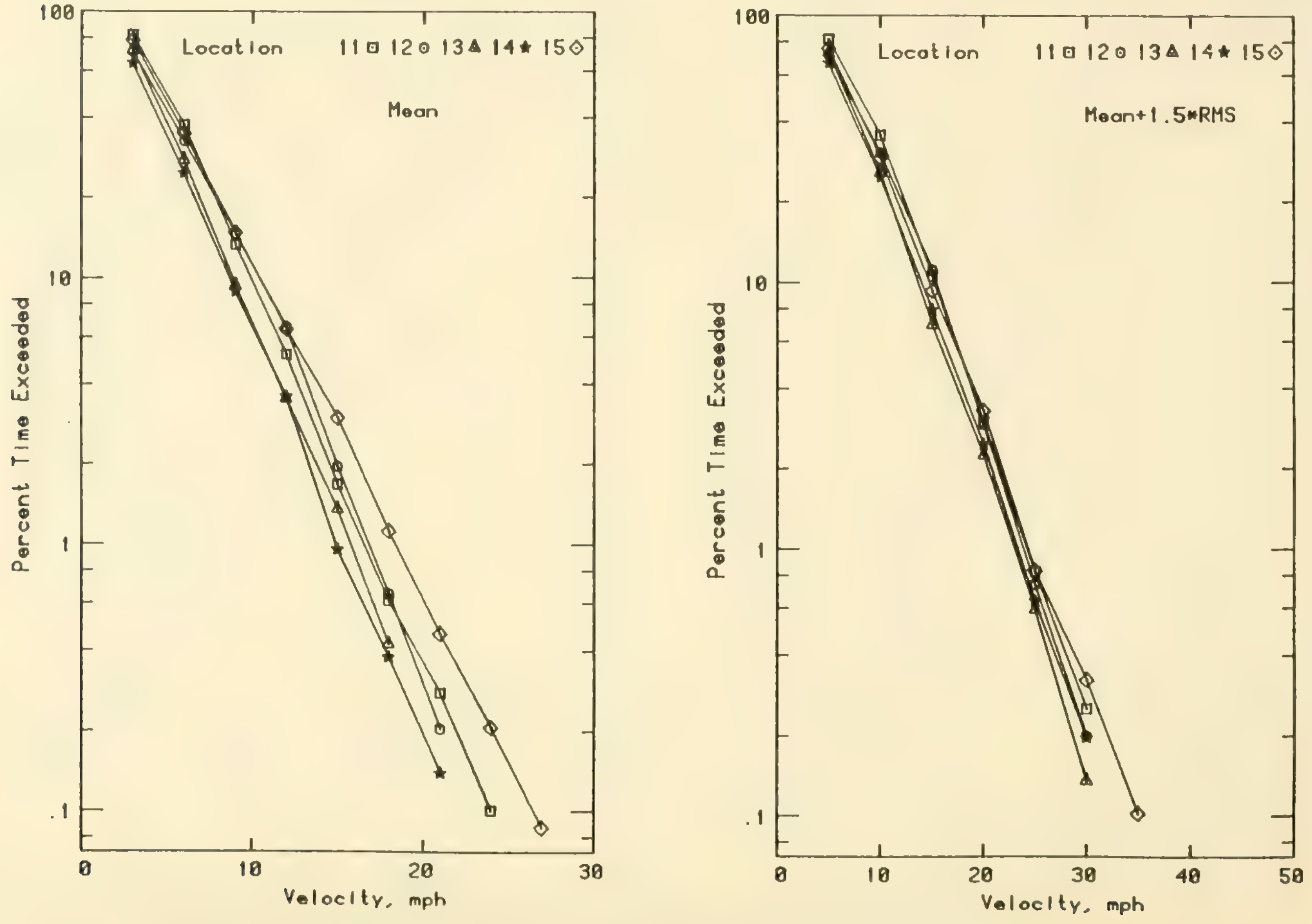


Percent Time Exceeded for PH1 Configuration



Percent Time Exceeded for PH1 Configuration



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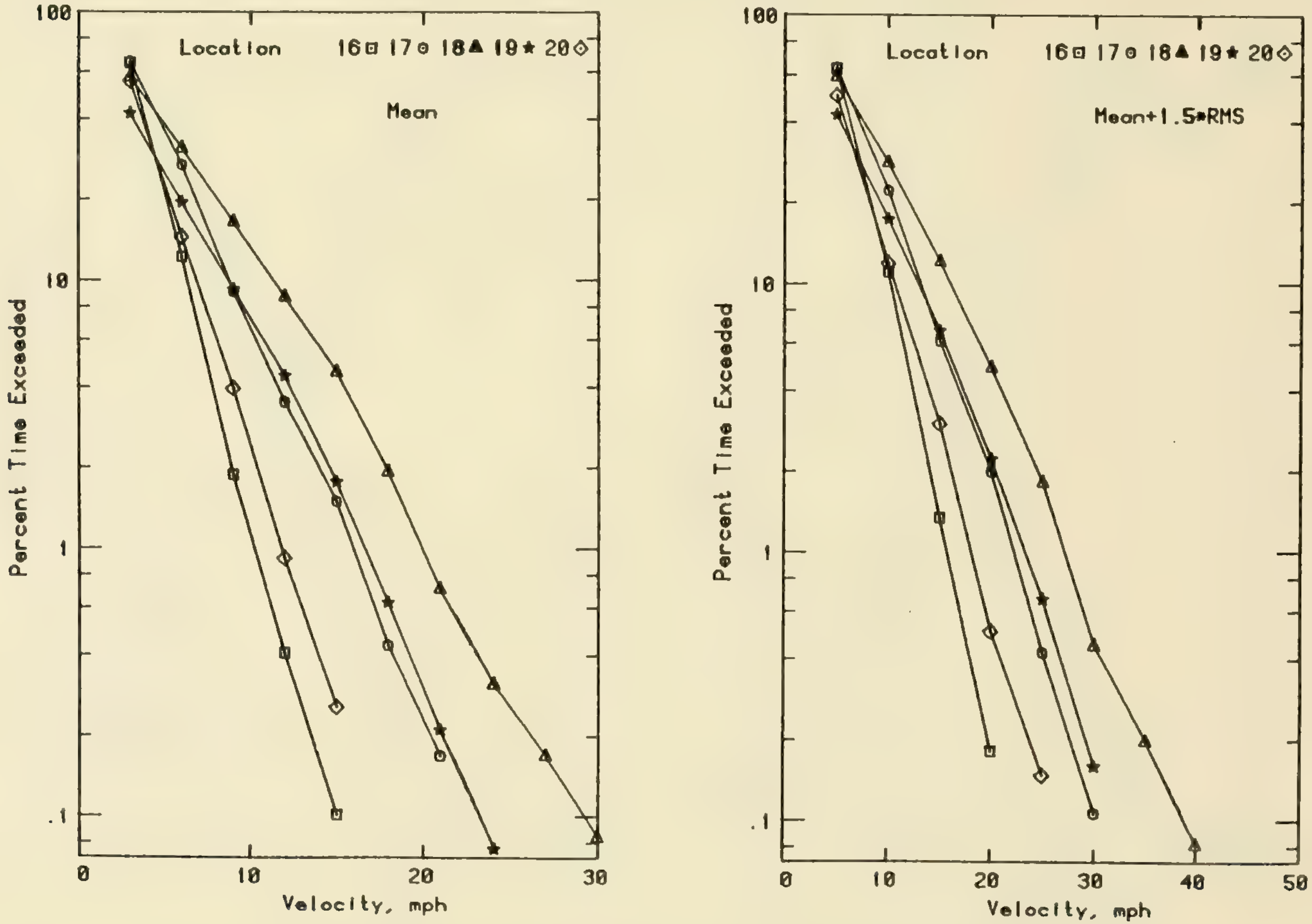

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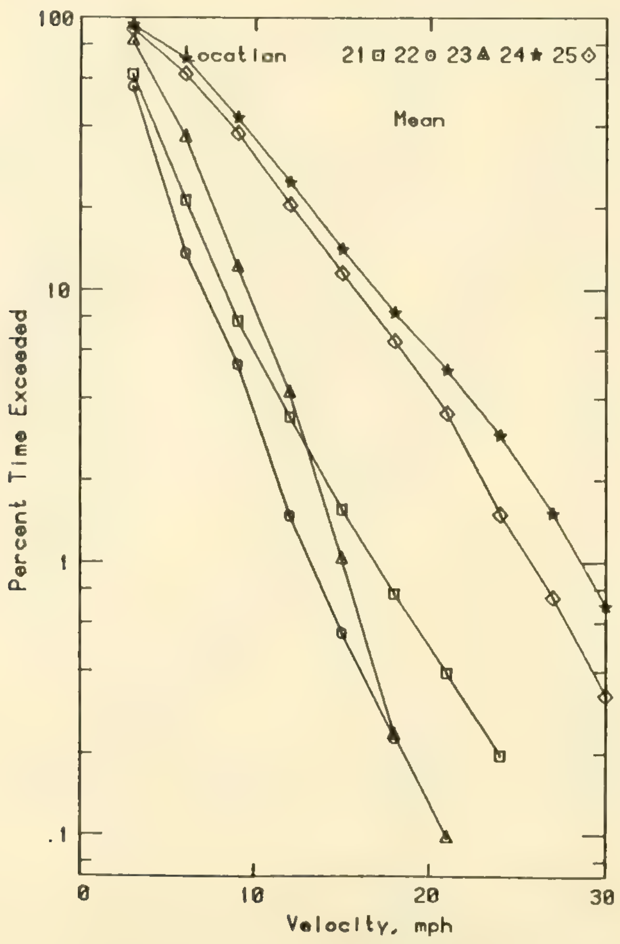

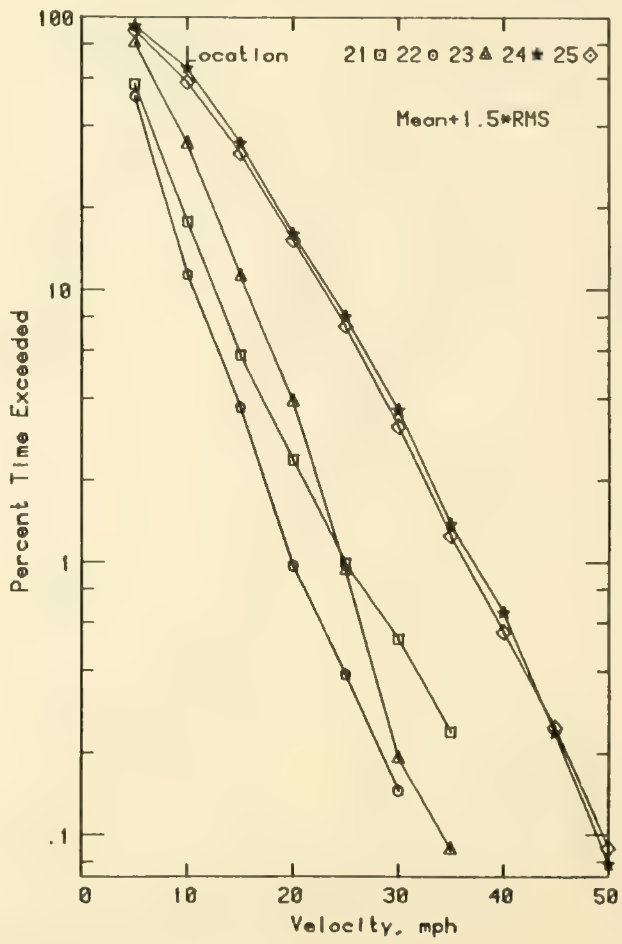

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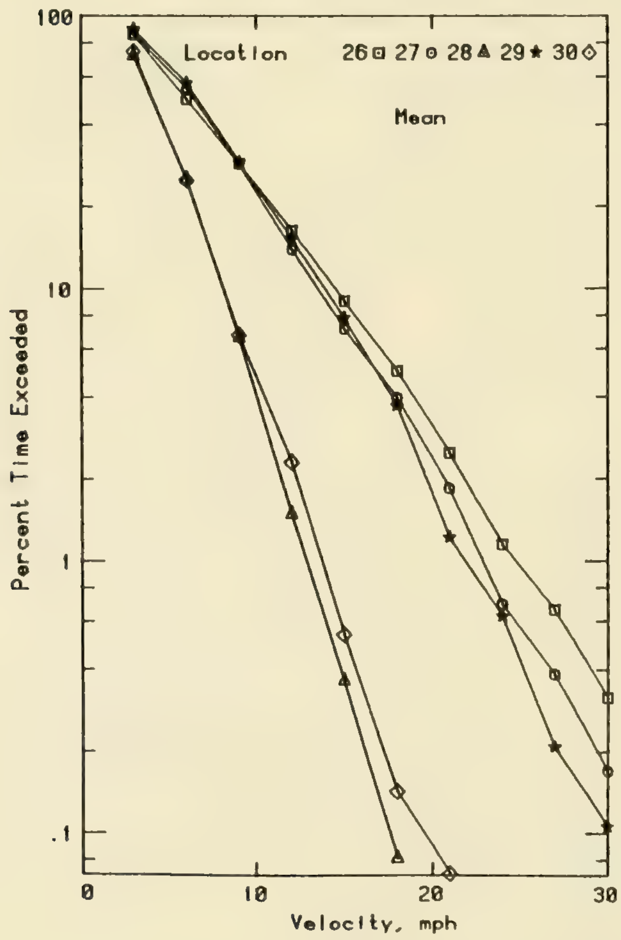

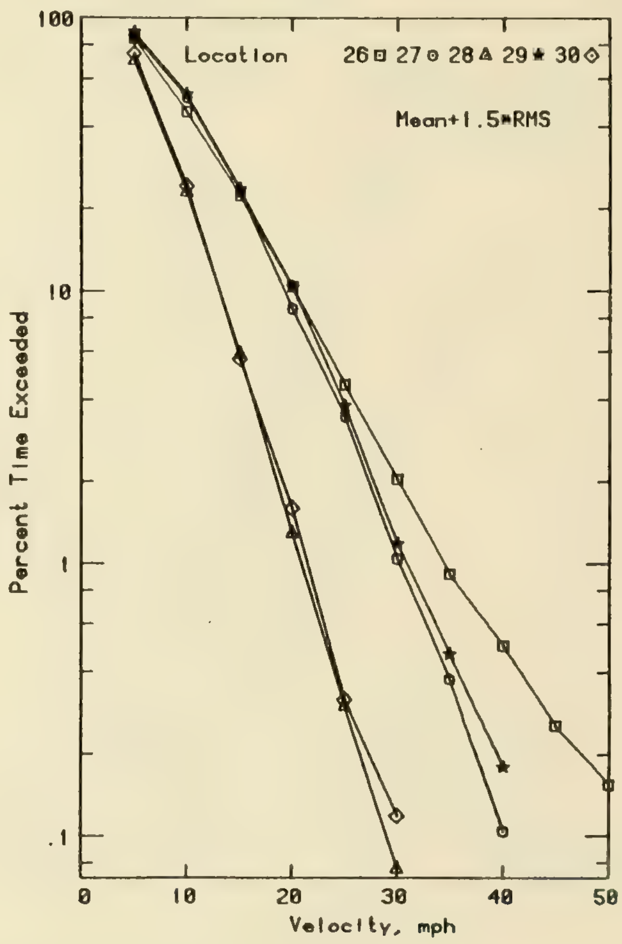

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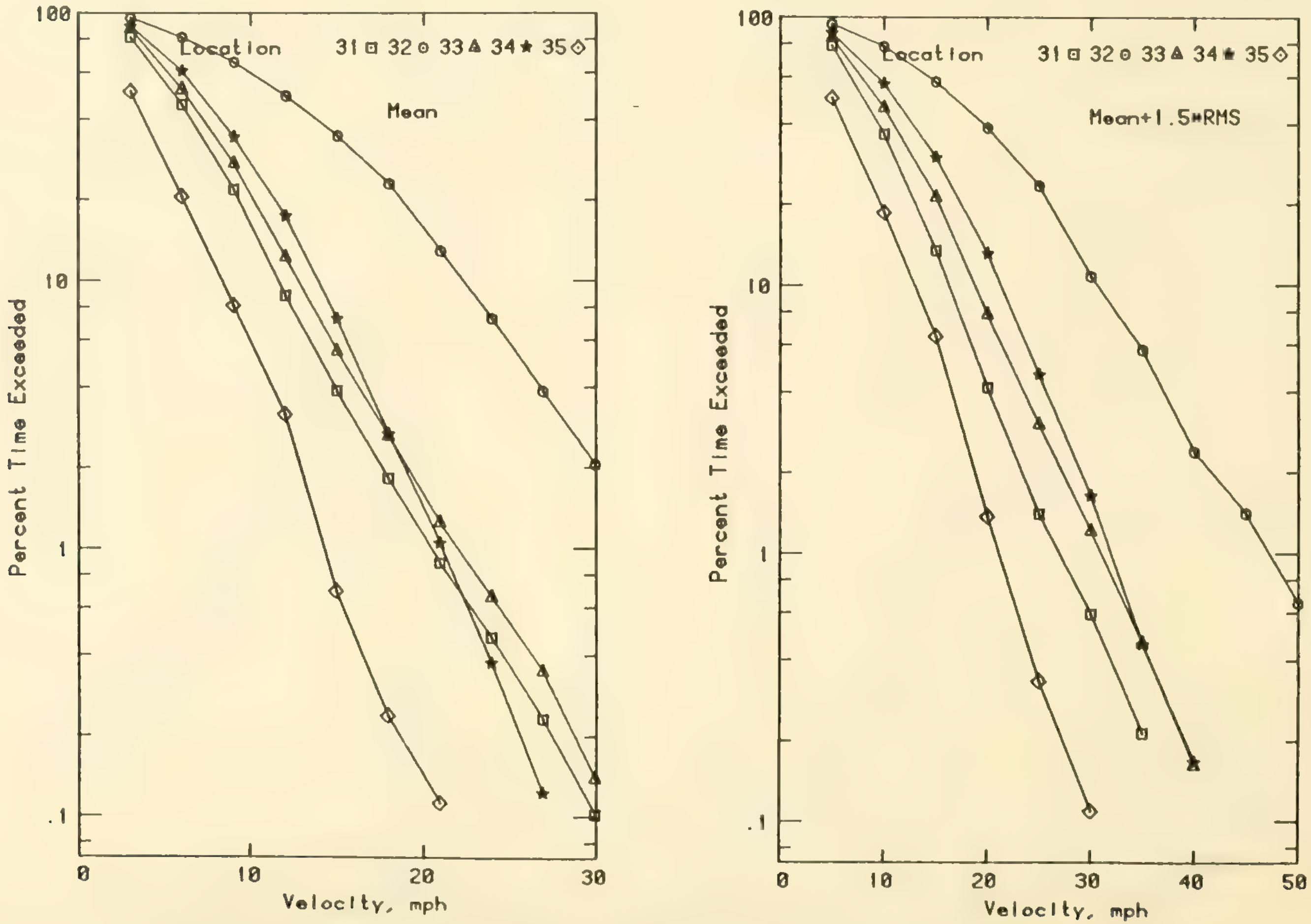

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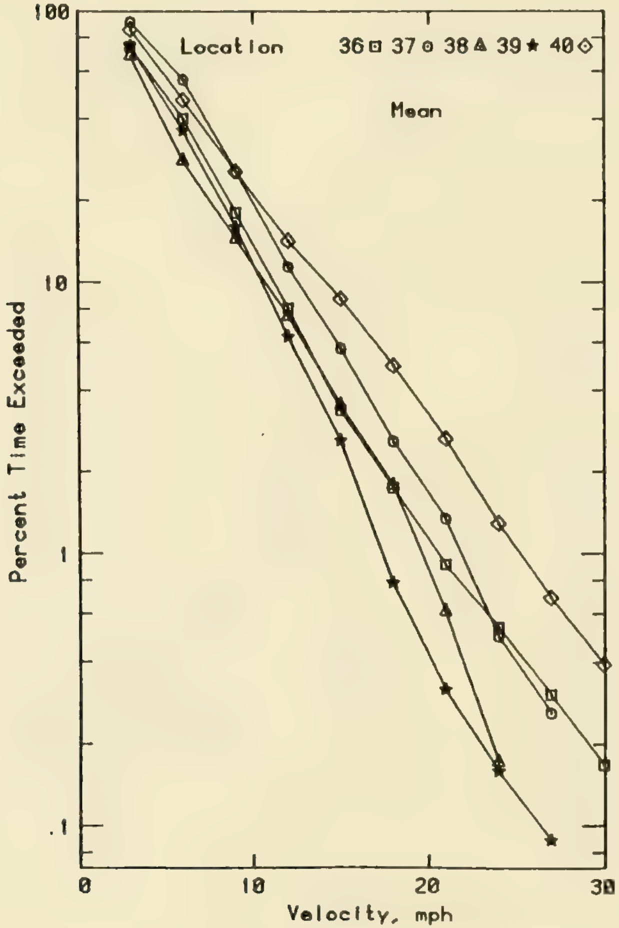

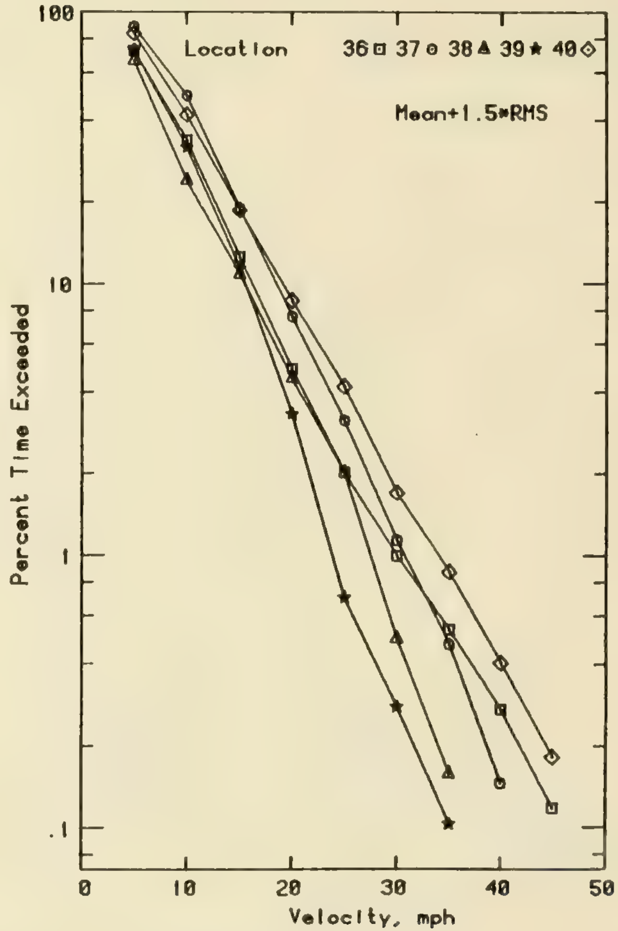

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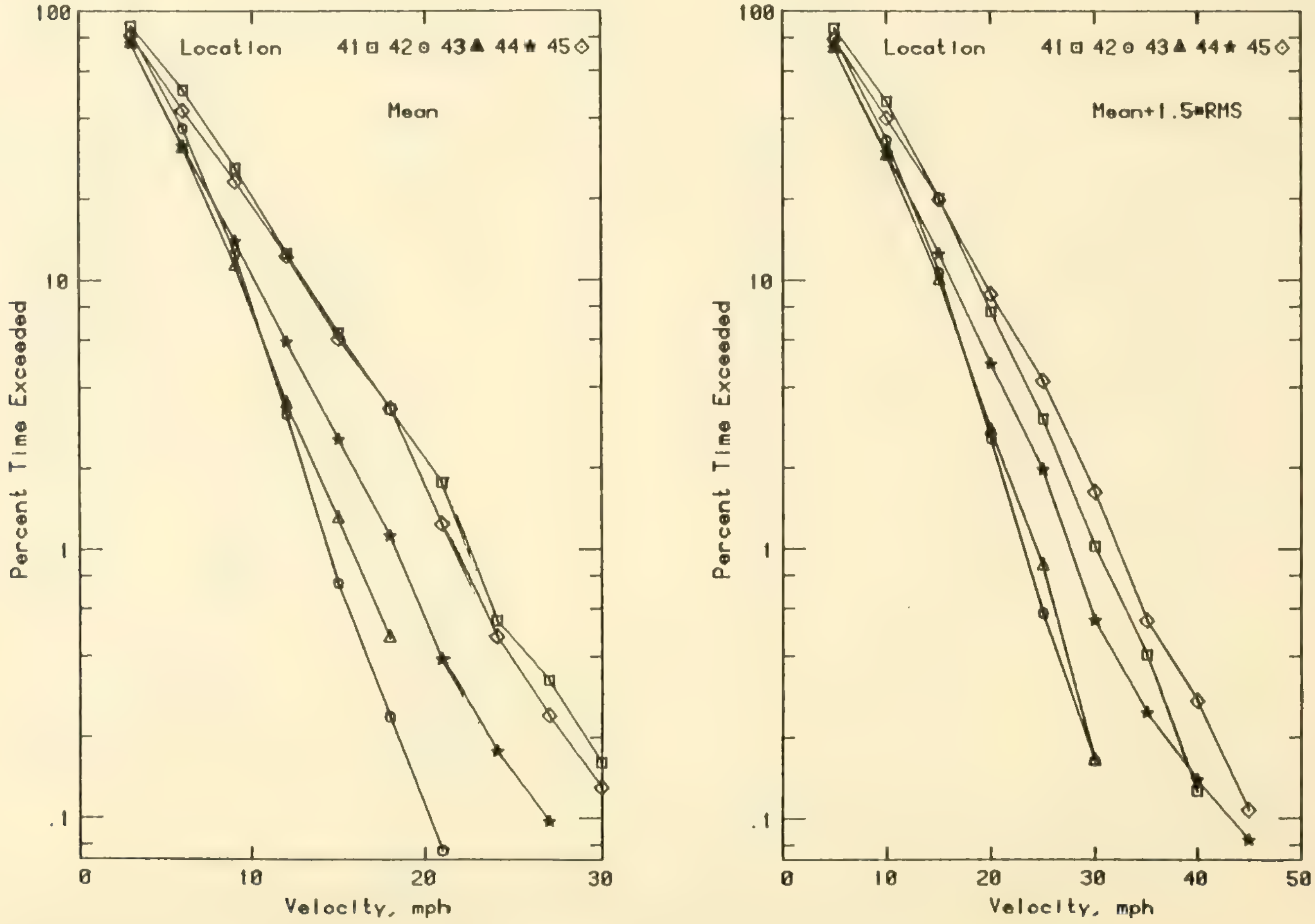

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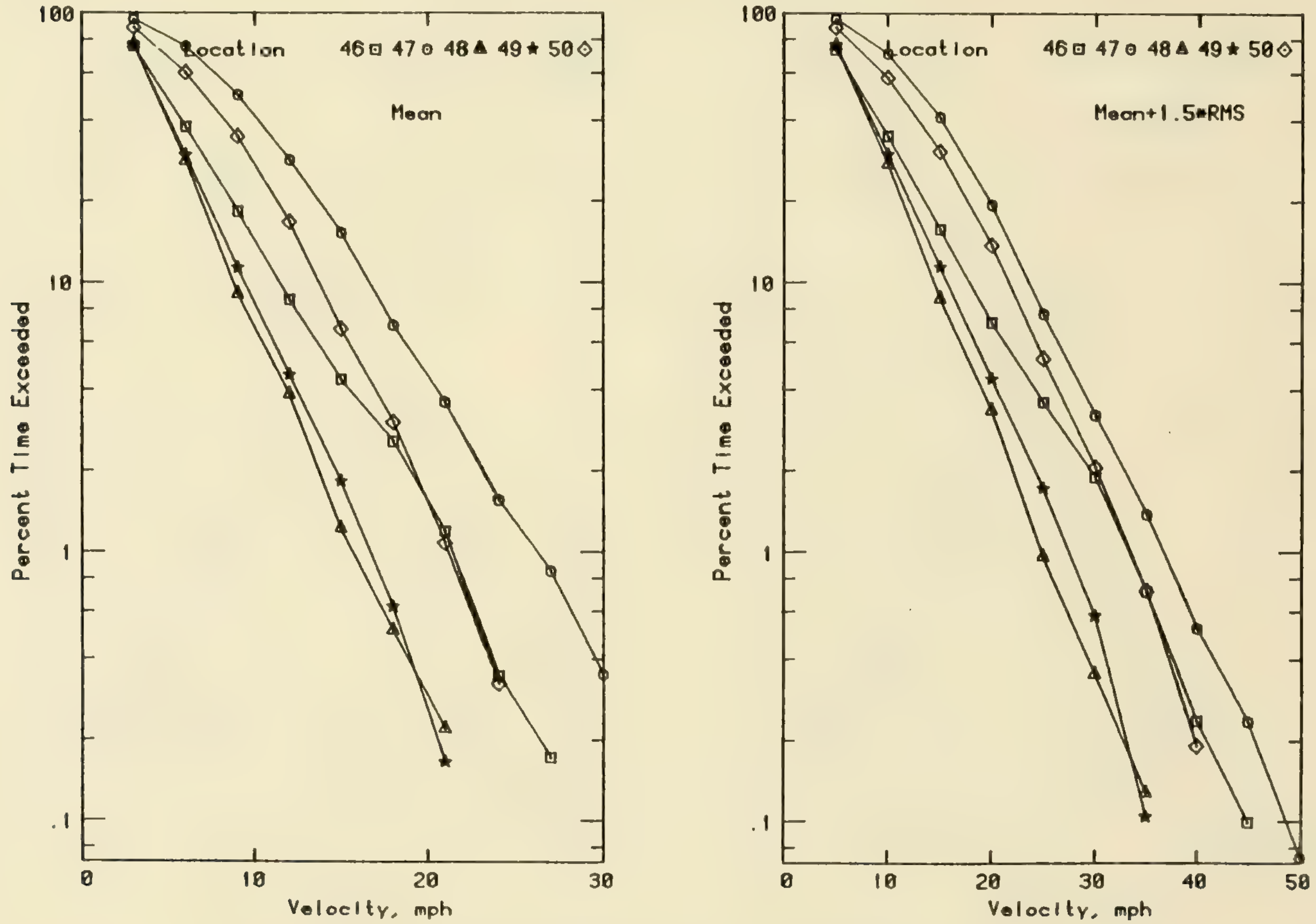

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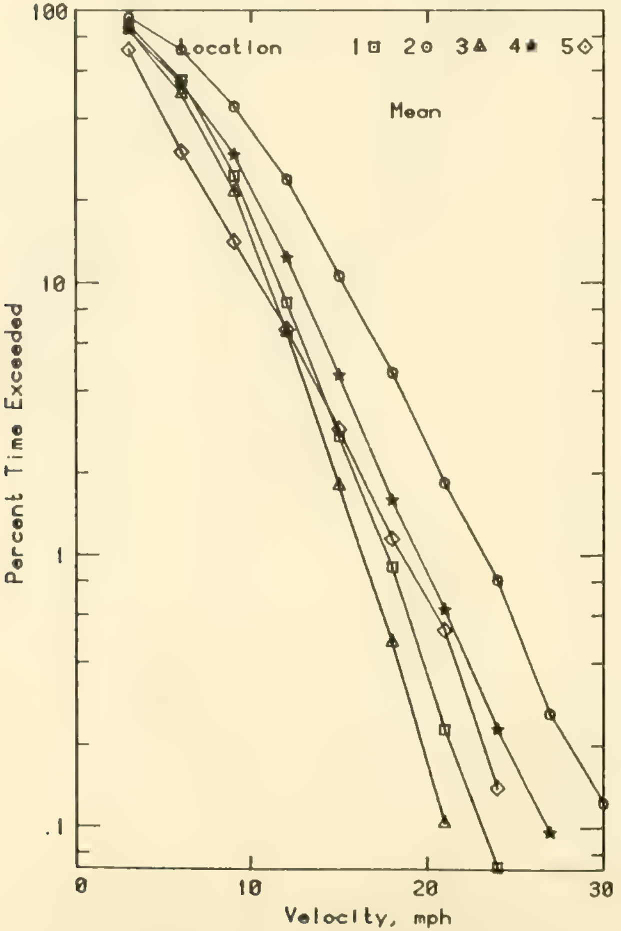

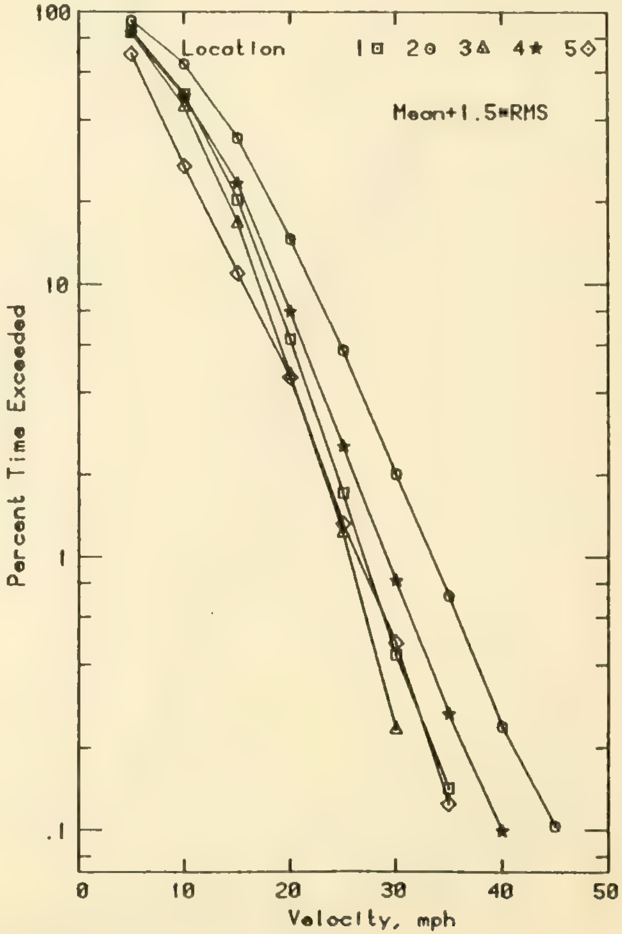

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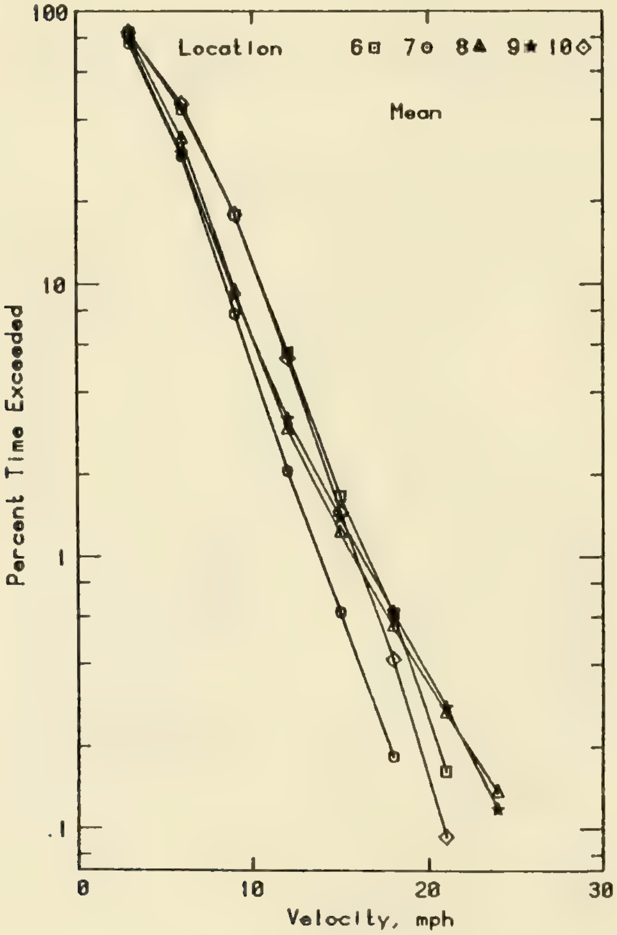

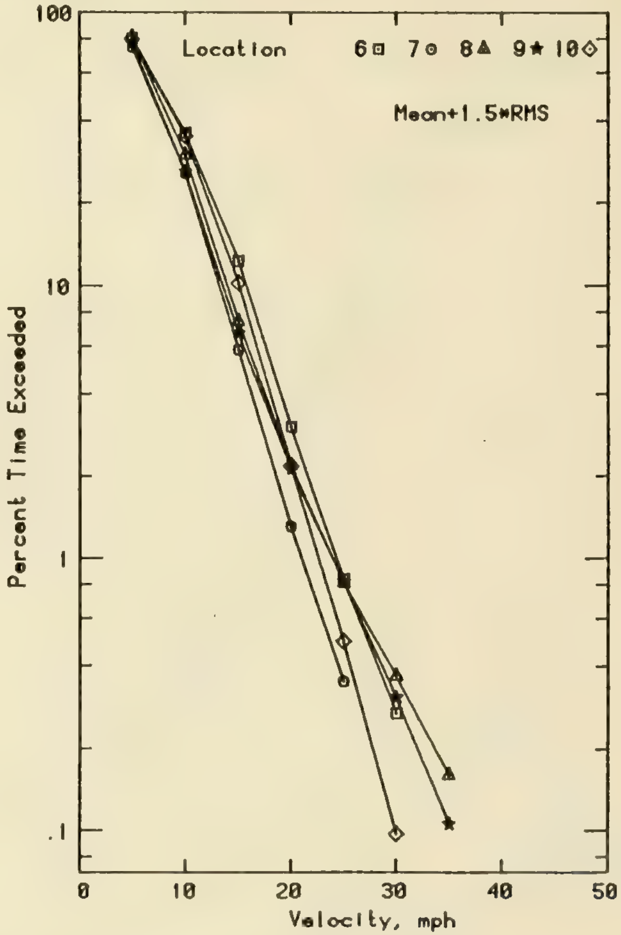

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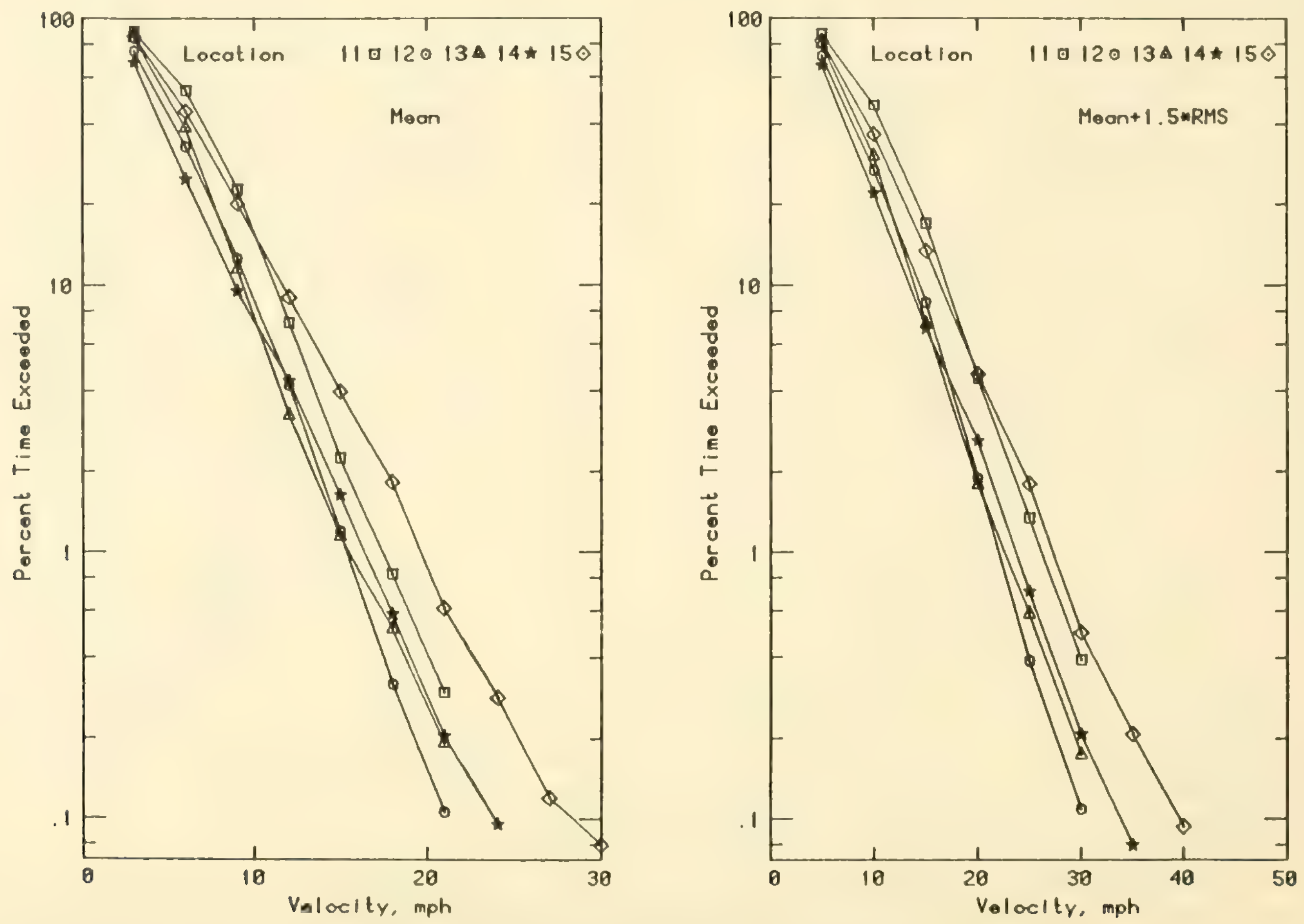

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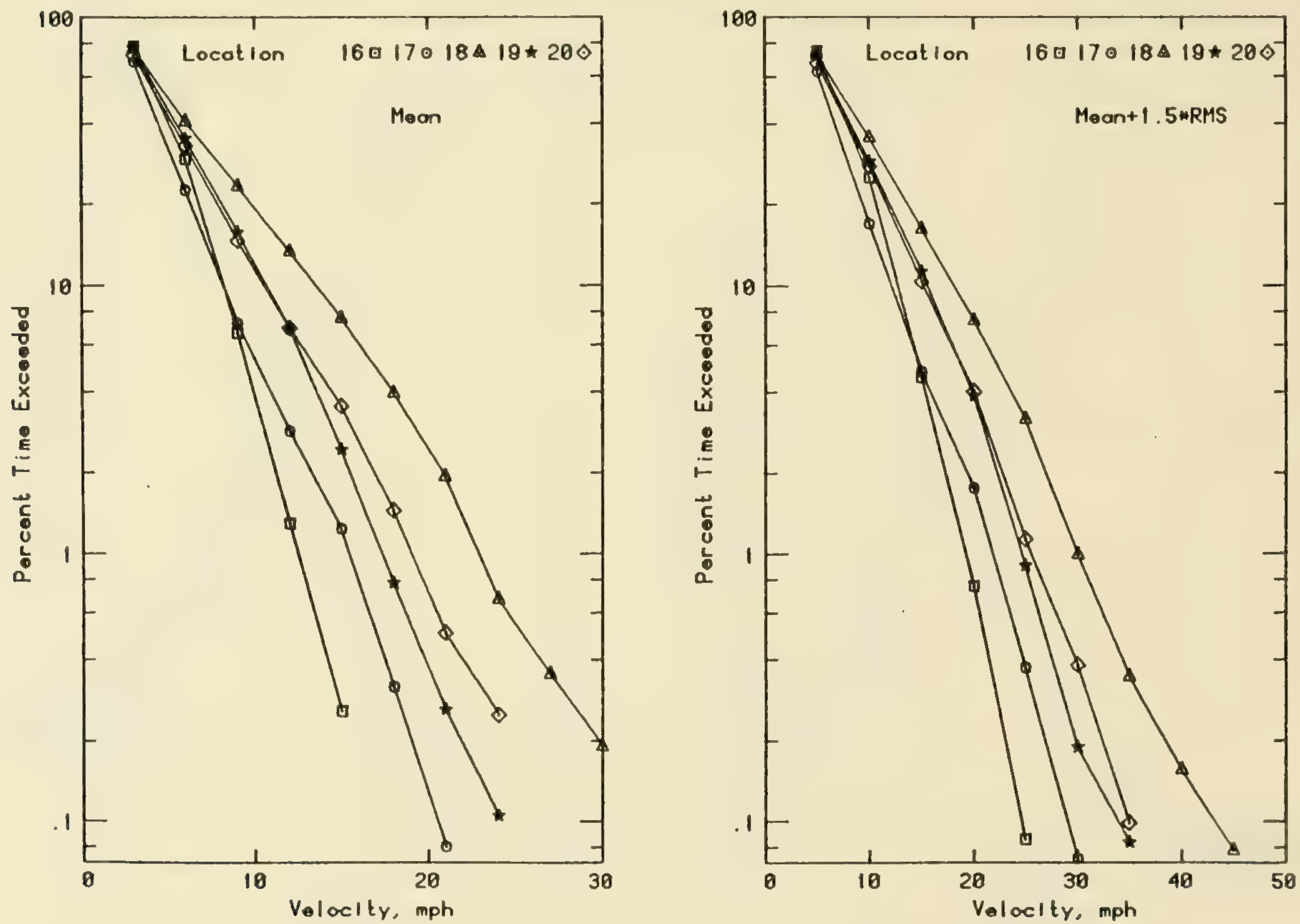

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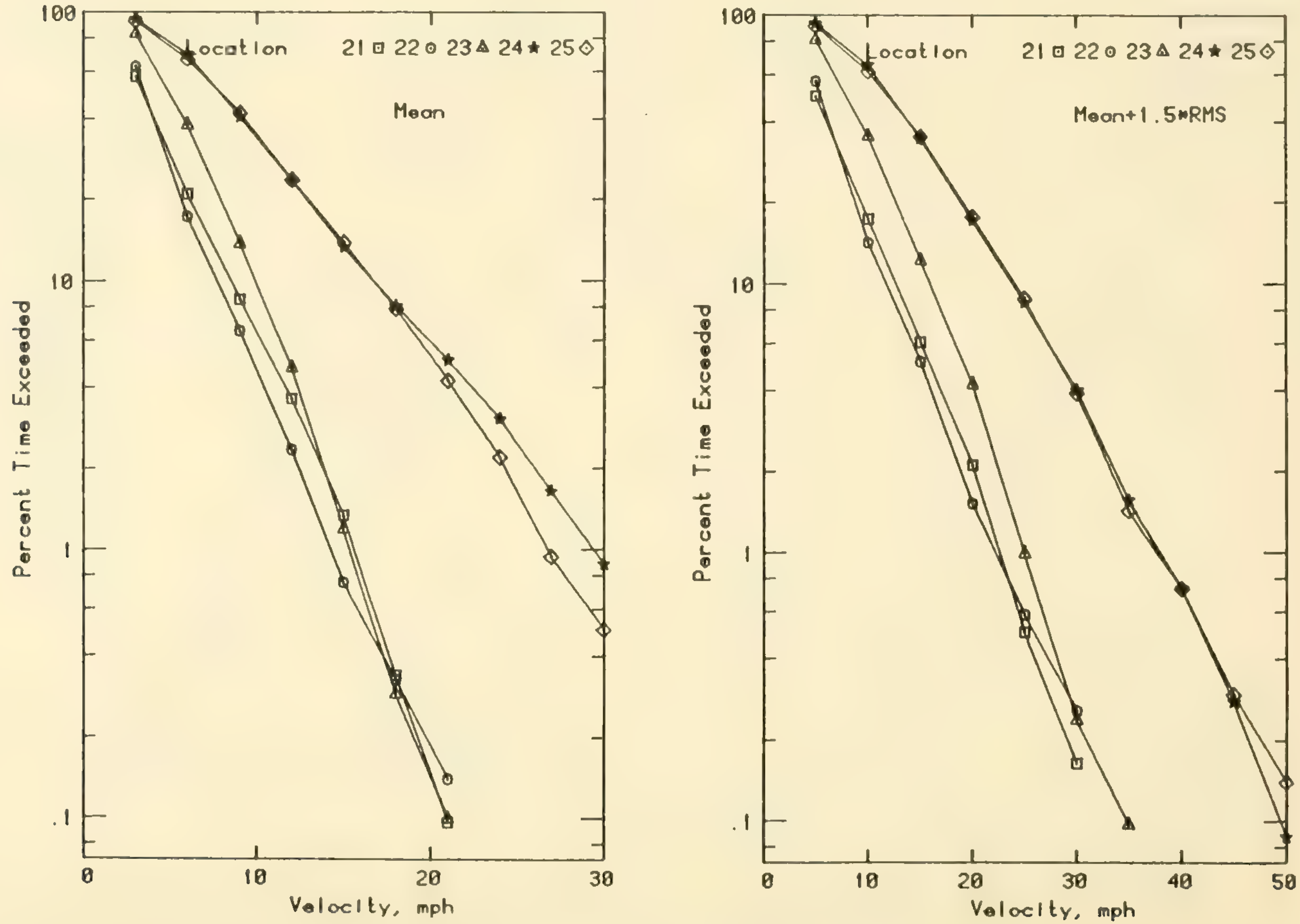

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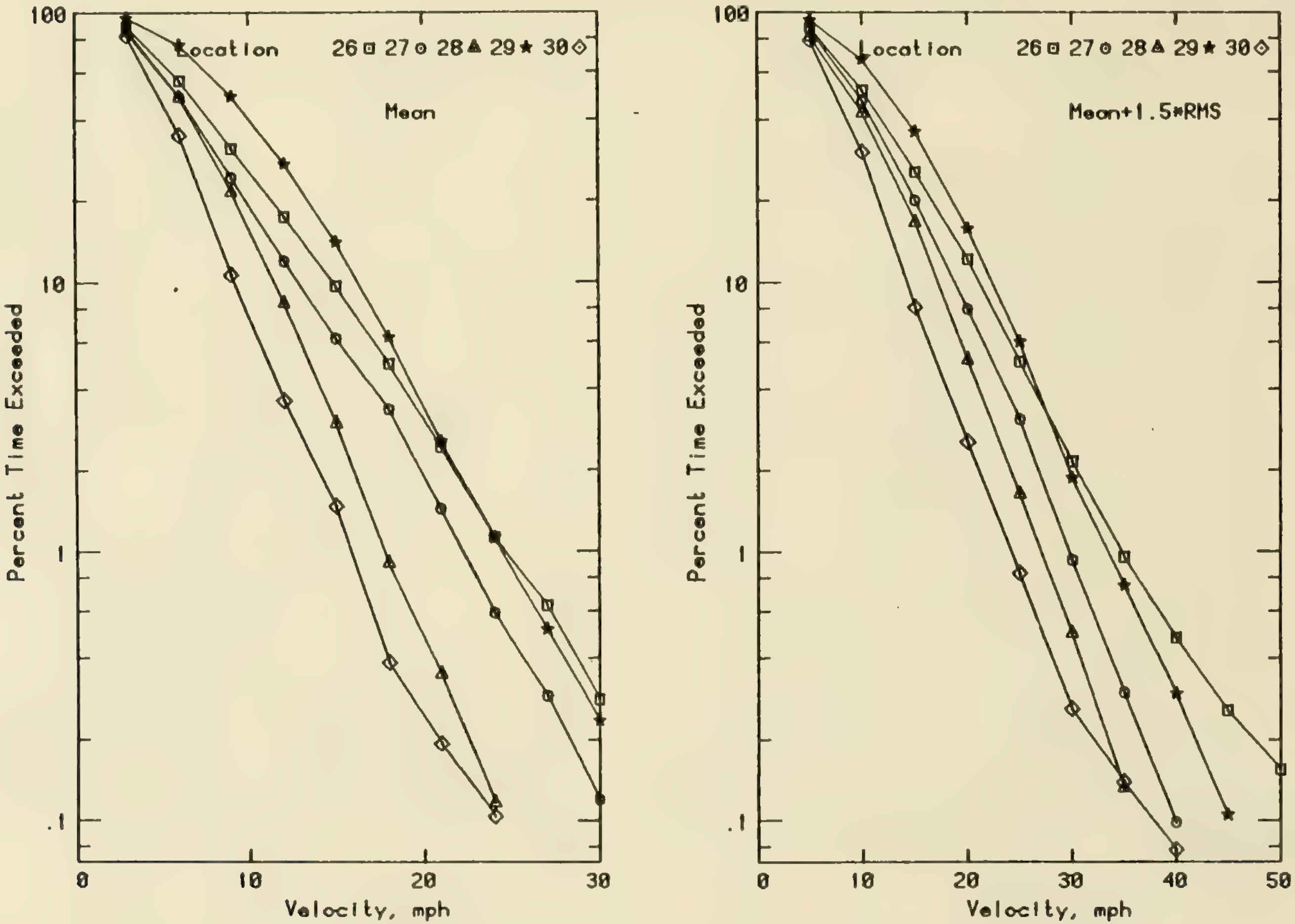

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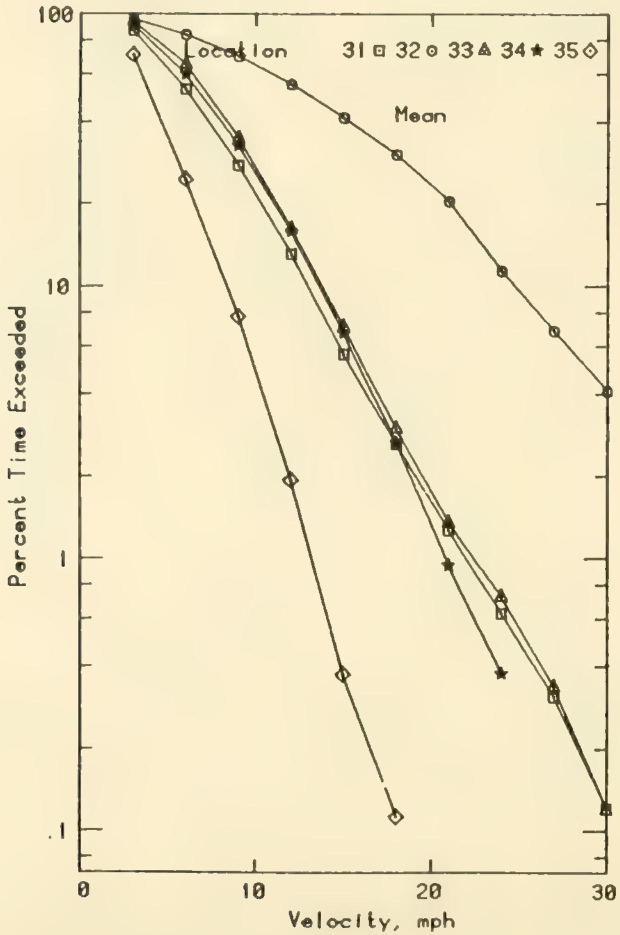

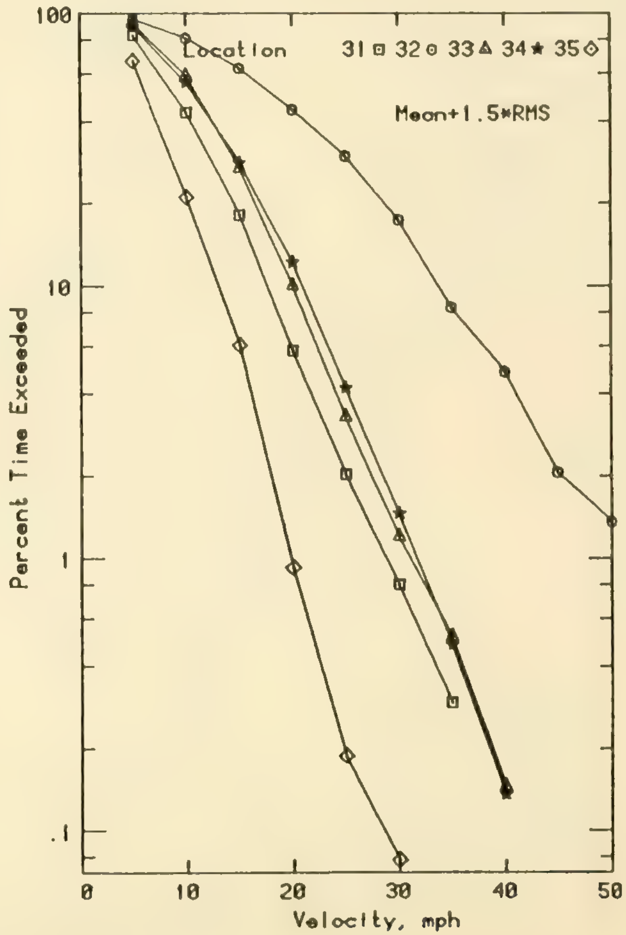

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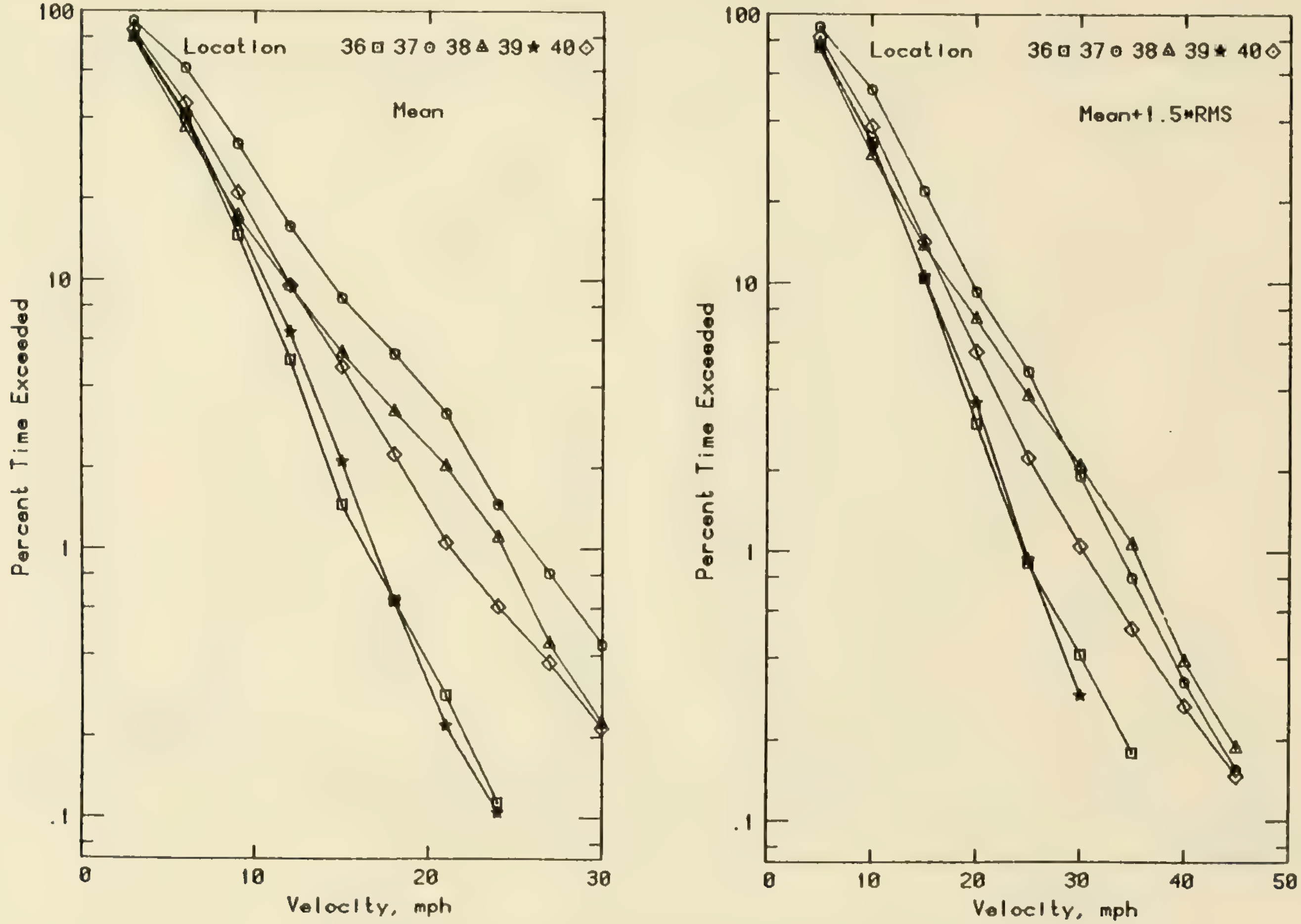

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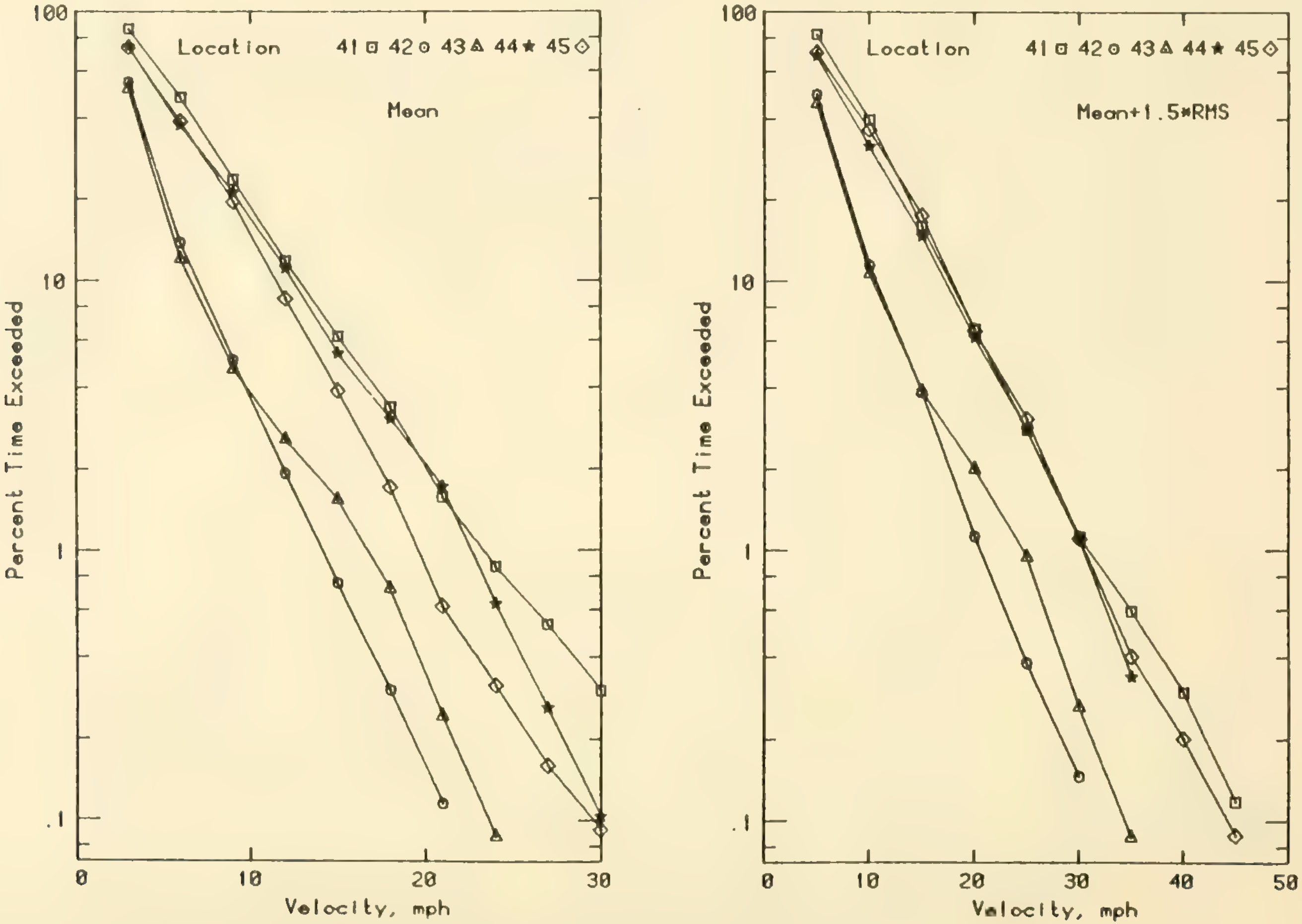

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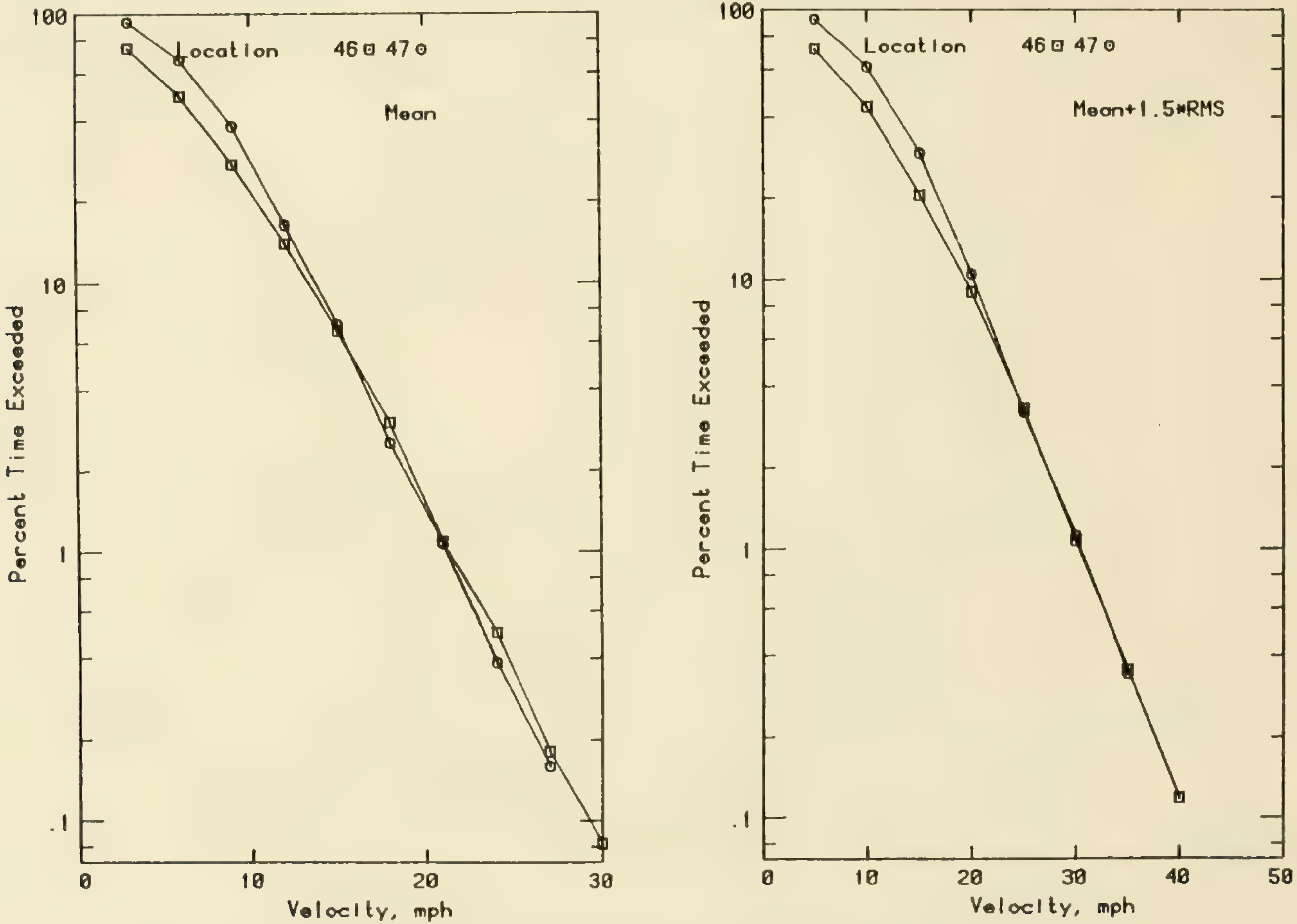

Percent Time Exceeded for PH2 Configuration